ILLUSTRATED
# ELECTRICAL REVIEW
A Journal of Scientific and Electrical Progress.

VOL. 29. No. 11. WEEKLY. | NEW YORK, WEDNESDAY, SEPTEMBER 9, 1896. | $3 PER ANNUM. Single Copies, 10 Cents.

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Entered at Post Office, New York, as Mail Matter of the Second Class.

## VIEWS, NEWS AND INTERVIEWS.

The General Post Office, St. Martin's-le-Grand, London, contains the largest telegraph office in the world. Over 3,000 operators, 1,000 of whom are women, are employed.

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An amusing instance of anticipation of the penetrating character of the so-called X rays, according to an exchange, has been discovered in a most unlikely place; *i. e.*, in Dickens's "Christmas Carol." It will be remembered that when the miser Scrooge sees the ghost of his former partner Marley entering the room, Marley's body appears to be transparent, so that Scrooge can see clear through him and discern the two buttons on the back of his coat. It may be presumed that Marley wore the old-time blue coat with brass buttons, and that flesh and blood became transparent when metal buttons would not. It is now in order for the Society of Psychical Research to try the X rays for the detection of ghosts, but if they are successful they must give the credit to Dickens.

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It is proposed to erect a monument over the grave of Georg Simon Ohm. Subscriptions will be received by the Königliche Filialbank, Munich, Germany.

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Some experiments on the effect of heat on insulating materials made by Mr. C. E. Skinner, are summarized in the following conclusions: 1. The insulation resistance of all ordinary fibrous insulating materials, such as paper, cloth, etc., decreases upon being heated up, and then increases again when the moisture is expelled. 2. Continued heating of 31 hours at 120 degrees centigrade does not lower the insulation resistance of paper. 3. The insulation resistance of completed apparatus shows the same characteristics as the insulation resistance of materials taken separately. 4. A low insulation resistance is not necessarily an indication of poor insulation, but probably an indication of the condition of the apparatus in regard to moisture. 5. A high electromotive force should not be applied to apparatus when the insulation resistance is low. 6. Material which is badly deteriorated mechanically by heat may still have a high insulation resistance, but very poor insulating qualities.

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Nearly 100 cars have been taken off the various lines of the West Chicago Street Railway owing to increasing use of bicycles.

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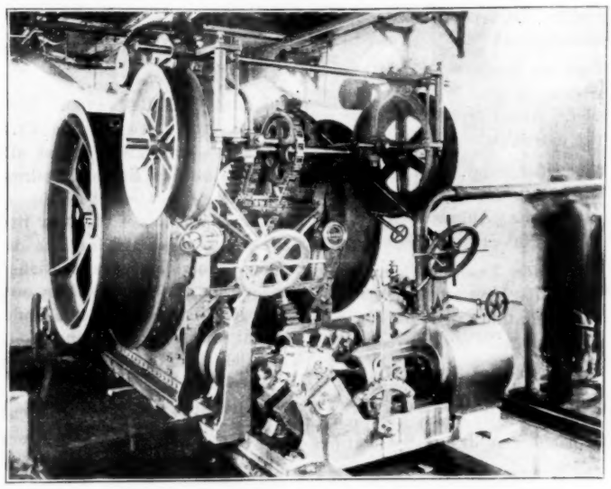
By the use of the electric furnace, M. Moissan has been able to prepare the metals whose oxides have been looked upon as irreducible by carbon, says London *Engineering*. He obtained uranium in this way three years ago, and in a recent number of the *Comptes Rendus* he gives a complete account of its preparation and its properties. It is isolated in three ways: by the action of sodium at a red heat upon the double chloride of sodium and uranium, by electrolysis of this double salt in the fused state, and from the oxide by reduction with carbon in the electric furnace. The last process gives the best yields if the heating in contact with carbon is not unduly prolonged and if air is excluded. Metallic uranium, when pure, is perfectly white, and is not magnetic if free from iron. It is not hard enough to scratch glass, takes a good polish, and can be filed with ease. It is much more volatile than iron in the electric forge. M. Henri Becquerel, in the same number of the *Comptes Rendus*, tells of a remarkable and probably unique property of this metal—that of emitting invisible phosphorescent rays capable of producing photographic effects after traversing opaque bodies such as cardboard, aluminum, copper and platinum, and also able to discharge a gold-leaf electroscope. The effects produced are precisely similar to those obtained from uranium salt, except that they are nearly four times as intense.



Cable-Laying Gear on the Steamship "Tutanekai."

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The cable up the Amazon River from Para to Manaos, which was laid last Winter by the "Faraday," was in operation only 32 days when it parted. Five different breaks have been found. At some points the water is said to flow eight to ten miles per hour.

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It is reported that offers have been received by the bondholders' committee of the Los Angeles, Cal., Consolidated Electric Company of $1,028,140 for pooled bonds, for which those of the Los Angeles Railway Company are to be substituted. The offer is said to be in behalf of Barney Barnato and Cecil Rhodes.

## Cable-Laying Gear on the Steamship "Tutanekai."

The above named vessel, which was built for the owners by Messrs. Dunlop & Company, of Port Glasgow, is designed for several purposes, the most important of which is the repairing of the New Zealand Government cables, and Messrs. Johnson & Phillips, of Charlton, England, who have had such large experience in machinery for this work, were entrusted with the complete outfit of apparatus, accessories and stores for this purpose.

A novelty in the design of all the deck-cable machinery and fittings is that it can all be easily removed, so that when the ship is not required for cable purposes the whole of it can be taken away and put into store, leaving the decks free.

All the holding-down bolt holes are provided with sockets into which plugs can be screwed so as to leave the deck perfectly water-tight when the gear is removed.

The picking-up and paying-out machine is extremely compact, though it is a double machine and is designed to pick up cables under a strain of 20 tons. It weighs only nine and one-quarter tons and occupies a deck space of but eight feet three inches by eleven feet six inches. It is very similar in design to the gear recently fitted by Messrs. Johnson & Phillips on the Japanese Government steamer, except that it is not quite so powerful and has horizontal engines instead of vertical.

The machine is built on two frames made of steel plates with steel angles inside and outside with welded corners. The drum shaft, which has a large collar welded on for attachment to the frame, ties them well at the top. The forward bottom ends are tied by a steel plate and also by a flanged shaft which carries the fleeting knives and takes the eyes of the main brake straps. There is also a T-bar stay at the bottom after end as well as diagonal stays at each end of the pairs frames, thus making a very stiff job and allowing of the whole of this part of the gear being lifted out in one piece without fear

of the shafts or bearings getting out of line.

The machine is designed for two speeds, which can be geared on to either drum, but the port drum only is intended for the heavy lift of 20 tons, for which purpose it is built in steel, whereas the starboard drum is of cast-iron.

These drums are six feet seven inches in diameter by two feet wide over all. They are internally geared and have a rim cast in for the main brake, and so combine main drum, brake drum and gear-wheel.

These drums are arranged to run loose in the shaft and are capable of many combinations with the gearing, as follows: Both drums can work loose without the engine; both drums can work at the same speed with engine; one drum can be driven by engine while the other runs independently; one drum can be held by brake while the other is being worked by engine; power of both brakes can be put on to one drum by keeping the pinion in gear.

All wheels are arranged to draw out of gear where possible, when not required for driving, so as to avoid rattling. In the case of the pinion which gears with large drums, this necessitated cutting large holes in the frames so that the pinion could pass right through them. The frames at these parts are provided with large, circular, cast-iron pockets, which carry bearings at each end so that when the pinion is in work it is close up to a bearing, thus insuring a very sound job. The brakes consist of steel straps with elm blocks attached to the ends of the straps, being fitted with steel castings, which carry nuts with right and left-hand threads to take the brake screws. The screws and rods are taken down to the after end of the machine so as to be worked from the main deck. The lower part of the brake strap is fitted with a large cast-iron eye, which transmits the strain to the lower part of the machine frames by means of a steel shaft, which is secured to the frames by large cast-iron flanges.

Hauling-off gear is driven by chain from intermediate shaft, so that its speed is always proportionate to that of the drums. For holding-back purposes the sheaves have a brake rim cast on them, and on these rims a steel strap with screw adjustment is fitted so that the amount of "drag" put on the cable can be adjusted minutely. The sheaves can slide along on their shaft to suit an inside or outside lead. A small pump is fixed between the frames to supply the main and holding-back gear brakes.

The engine has cylinders 9-inch, and 16-inch by 10-inch stroke, suitable for steam at 160 pounds per square inch, and it is complete with automatic bye-pass valve, steam valve and link-motion reversing gear, all of which, with the main and holding-back brakes, are within reach of one man at the after end of the machine. The gear was run under steam pressure at Messrs. Johnson & Phillips's works, and also on board the vessel, to the satisfaction of the consulting engineers, W. H. Preece, Esq., and W. R. Culley, Esq., of H. M. S. S. "Alert." The bow gear consists of two steel sheaves three feet two and one-half inches diameter by 11½ inches wide, which run loose on a steel shaft supported in cast-iron brackets attached to three steel girders. Each sheave is provided with cast-iron whisker guards to prevent the cable getting off the sheave, these guards also being bolted securely to the whiskers. The girders are fitted with eyes and bollards to secure the stoppers. A davit is provided between the sheaves for launching mushrooms, etc., and is arranged to fold down out of the way when necessary to let go the "bight."

The vessel is fitted with the usual dynamometers, lead wheels, deck leads, troughing, etc., and is fully equipped with a complete outfit of stores and accessories, including grapnel and buoy ropes, grapnels, mushrooms, buoys, chains, sounding shot, steam sounding machine, steam hauling gear, etc., and the testing room was provided with a set of first-class instruments.

## ELECTRIC RAILWAY NOTES.

The Auburn, N. Y., City Railway Company will lay new tracks in State street.

A receiver has been appointed for the Chattanooga, Tenn., Electric Railway Company.

Work on the Milwaukee, Racine & Kenosha, Wis., Electric Railway is progressing rapidly.

Work on the new electric road to Dearborn, Mich., is being rapidly pushed. About 500 men are at work on the extension.

The Richmond, Va., Traction Company's gross earnings for two months, ending August 19, 1896, were $26,394. Net earnings, $16,803.

The Union Traction Company, of Philadelphia, have recently made extensive alterations in their car barn at Eleventh and Colona streets.

A. P. Crell, of Ionia, Mich., has invented an electric mail car which will automatically pick up or deliver mail pouches at designated stations.

The Newton, Mass., street railway directors will apply to the State Railroad Commissioners for authority to issue $100,000 of additional stock for new extensions.

The West Chicago Street Railway Company has issued another $1,000,000 of six per cent debenture bonds, and it is believed that upward of another million have been authorized.

The Detroit Street Railway Company's gross earnings for July, 1896, were $38,140; net earnings, $12,187. January 1 to July 31, 1896, gross earnings, $250,246; net earnings, $75,279.

Rail laying has commenced on the line of the extension of the Long Island Electric Railroad, east from Grand street, Jamaica, to Hempstead. The rails are to be laid as fast as the grade is established.

The Warren, Ohio, and Mahoning Valley electric railways have established a freight service on their lines and will run cars regularly for the transportation of packages and goods of nearly all kinds. The plan is experimental, but if found practicable will be continued.

It is now claimed that the electric railway company seeking permission to use certain St. Paul, Minn., streets is not a street railway company, but a corporation which has in view the construction of an electric road between St. Paul and Superior. The use of the streets was asked to facilitate the acquisition of terminal facilities.

It is said that the New Castle & Wilmington, Del., Electric Railway Company is negotiating for 35 acres of ground below Cofield Beach, about two miles south of New Castle. This would give them one of the finest beaches that there is on the shore above Woodland Beach. Should they decide to have their charter so amended, it is proposed that the line shall be extended to Delaware City.

The Southwest Missouri Electric Railway Company, of Webb City, Mo., has purchased all the property belonging to the Jasper County Electric Railway Company and the Joplin & Galena Electric Railway Company, and now owns a line from Carthage, Mo., to Galena, Kas., making 32 miles of road owned by the company, and connecting Carthage, Carterville, Webb City, Johnstown, Prosperity and Galena.

The Central Railway and Electric Company, of New Britain, Ct., has filed its answer to the recent allegations of the New England Railroad in the latter's suit against the three trolley companies. The New Britain company, speaking for the three, denies generally the allegations, and specifically the ones that they entered into any illegal agreement, made any illegal transfer of stock, or intend to parallel the New England between Plainville and Bristol, 29 miles.

The Sioux City, Iowa, Electric Company's power house was recently partially destroyed by a train of coal cars on the Illinois Central road. The cars, eight in number, were being backed up the main track, when they struck an open switch leading directly toward the building. The engine was reversed, but the shock broke the coupling and the cars smashed into a corner of the building, wrecking it badly. No one was hurt, but considerable time will be required to repair the damage.

Several of the St. Louis street railway companies are trying to raise the standard of their employés. The managers of these companies decided in the early Summer that, as labor was plentiful and comparatively cheap, they could, with perfect propriety, put up the average of efficiency a peg or two. They decided that plodders and those who performed their duties in an indifferent manner must be supplanted by persons with more vim and intelligence, and thus benefit the company as well as please the patrons of the roads.

A continuous trolley line between Stamford and South Norwalk, Ct., is assured for the near future, and it is expected that it will be running before Winter. A gang of men are now at work extending the tracks of the Stamford Street Railway Company to Noroton River, at which point they will connect with the line of the Norwalk Tramway Company. The latter company is making preparations to connect, and it is believed the tracks will be laid across the river by October. Colonel Heft, of Bridgeport, president of the Stamford company, is doing the engineering work.

Work has been commenced on the underground electric railway in London. As now projected, the road will be only 10 miles long, but it will thread all the populous suburbs from Shepherd's Bush into the city, and the 14 stations will tap the great arteries of travel. The minimum depth of the tunnel will be 50 feet, and the maximum depth 100 feet, and access from above to the platforms will be had by monster elevators, each with a carrying capacity of 250 persons. Forty trains per hour are to be run. The fare will be four cents for the round trip. The schedule time for the 10 mile run, including 14 stops, is to be 15 minutes. To prevent any possibility of accident, there will be two distinct tunnels, one for the up and the other for the down traffic.

Chancellor McGill has filed a decree in the matter of the application of the Atlantic Highlands, Red Bank & Long Branch Electric Railway Company to have him define the mode whereby the company's proposed tracks shall cross the tracks of the New York & Long Branch Railroad Company at Red Bank. The decree was asked for under a law of 1895, which confers power upon the Chancellor, where a trolley road desires to cross the tracks of a steam road. On account of the expense of about $100,000, which would be involved by having the crossing made either by a tunnel or an overhead bridge, the Chancellor permits the crossing to be made at grade, but stipulates that the trolley company must first give a bond of $5,000 to pay a reasonable salary to an employé whom the steam road is directed to place in a tower at the crossing point, for the purpose of giving signals.

## OBITUARY.

Col. Joseph T. Ridgway, superintendent of the Trenton, N. J., Electric Light Company, committed suicide by shooting himself at his home, in Trenton, on September 3.

Charles J. Heims, 50 years old, an inventor known to many street railway men, committed suicide in Chicago on September 2 by drinking carbolic acid. No reason is assigned for his act.

### Cause of the Kings County Elevated Railroad's Failure.

[*From the New York World.*]

The treasurer of the Kings County Elevated Railroad, in explaining its bankruptcy, outlines clearly the causes which are at work to revolutionize the passenger traffic of Greater New York.

He shows that in the first year after electric roads were inaugurated his company lost $120,000, and though it gained some of it back during the trolley strike, the gain was only temporary. It continued to lose until the receivership was forced.

This is not surprising, but the assumption that it was inevitable is not warranted. The gain in trolley business in Brooklyn has been in spite of the great—and deserved—unpopularity of the management of the most prominent lines. People are using the electric cars, not because they love their management, but because electricity undoubtedly stands for progress and increasing concessions to public convenience.

It means, too, that if the elevated roads do not make corresponding concessions, they will be bankrupted. They must give the public modern cars, with modern heating, modern lights, modern motors and modern prices.

A three-cent rate for Greater New York is inevitable, and if the managers of the elevated roads refuse to see it, perhaps the receivers appointed for them by the courts will be more clear-sighted and more amenable to the impulses of progress.

### PERSONAL.

Mr. Thomas D. Lockwood, electrician of the American Bell Telephone Company, is enjoying a vacation in Newfoundland.

Mr. S. L. Phillips has resigned the presidency of the Metropolitan Street Railroad Company, of Washington, D. C., to take effect October 15.

Mr. H. M. Whitney, formerly president of the West End Street Railway Company, of Boston, has been elected president of the Halifax, N. S., Electric Tramway Company.

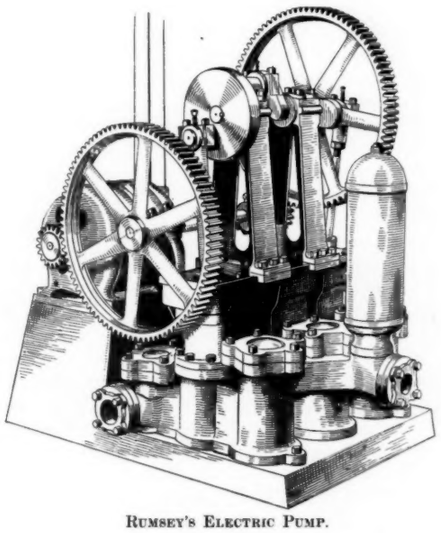
The ELECTRICAL REVIEW extends its congratulations to Mr. Frank H. Stewart on his marriage with Miss Abbie Rose Kirby, at Woodstown, N. J., on August 26. Mr. and Mrs. Stewart will make their home at Merchantville, N. J.

Mr. Francis Blake, of Weston, Mass., inventor of the Blake transmitter and a director of the American Bell Telephone Company, recently underwent a successful operation for appendicitis, and at last accounts was convalescing rapidly.

The *North American Review* for September opens with a most interesting paper by His Excellency, Sir Alfred Moloney, Governor of British Honduras, entitled, "From a Silver to a Gold Standard in British Honduras," wherein is described a financial transaction unique in the history of currency, and the material benefits derived from an establishment of a country upon a gold basis.

### Rumsey's Electric Pump.

The accompanying illustration shows a very compact pumping plant of especial value where electric current may be obtained at reasonable rates. The pump is of the vertical three-plunger type, the cranks being set 120 degrees apart. The effort of the plungers upon the liquid pumped is nearly continuous; thus a uniform pressure or vacuum may be maintained and a correspondingly high efficiency. By means of gears the slow piston speed is transformed into a high rotative speed. This feature is of especial value when the pumps are to be driven by electric motors. The motor shown is of the three-phase induction type, which does not require a rheostat when starting. These pumps are largely used for house-tank and hydraulic-elevator service, while the larger sizes are adapted to waterworks in small cities and towns. This pump may be so arranged, by placing the motor upon an iron bracket, as to be self-contained, thus allowing it to be placed on a car, rendering it portable. This arrangement is frequently adopted in breweries, distilleries and mills where the portable pump is desirable. Rumsey & Company, Limited, Seneca Falls, N. Y., are the manufacturers of this and other types of pumps which are described in a new catalogue just issued.



RUMSEY'S ELECTRIC PUMP.

### "Electric Power" Discontinues Publication.

TO THE EDITOR OF ELECTRICAL REVIEW:

By order of managing director we beg to notify you of the discontinuance of *Electric Power* magazine.

Yours truly,

"ELECTRIC POWER,"
per T. S. E.

New York, September 1.

### Incandescent Lamp Business is Good.

An encouraging sign of the times is that the demand for incandescent lamps is steady and strong. Among others, the New York & Ohio Company, of Warren, Ohio, makers of the Packard lamp, report that their business is in a very prosperous condition.

## TELEPHONE NEWS AND PROGRESS.

It is reported that the new Southern States Telephone Company is about ready to open its exchange at Norfolk, Va.

The work of erecting poles for the new long-distance telephone line between Parkersburg and Wheeling, W. Va., has been finished.

Canvassers for the new Delmarvia Telephone Company report that they have secured the names of 1,000 subscribers in Wilmington, Del.

The Arcadia Telephone Company has completed a line from Arcadia to Blair, Minn. Work will soon commence on the Waumandee and Montana branch.

There will be no legislation on the bills to provide a subway system for St. Louis until after October 13, when the local authorities meet after the October adjournment.

The Adams County, Pa., Telephone Company are pushing the completion of their lines. It is said that the line between Littlestown and Gettysburg will be ready for operation by November 1.

The Nova Scotia Telephone Company have just completed their new wire between New Glasgow, Pictou and Truro, connecting at Truro with their long-distance line at Halifax. Owing to increased business the company have found it necessary to put in a second wire between Truro and Halifax.

The Michigan Bell Telephone Company have begun their war on the new citizens' company, now building an exchange at Muskegon, by reducing rates on business telephones from $36 to $24, and on residence telephones from $24 to $12. The new company claims to have all the old company's subscribers.

The Southern New England Telephone Company has made many important extensions of its lines in Connecticut this Summer. Over 20 small towns have been connected. The company has just received permission to use poles in Bridgeport, on which to string its wires. The permit runs for 20 years.

The action of the South Bend, Ind., City Council in ordering all the telephones of the Central Union company removed from the city departments, and the instruments of the South Bend Telephone Company put in their stead, is being severely criticised by many citizens, leading business men and manufacturers of the city.

The Detroit Telephone Company's plant is rapidly approaching completion. Of the 60 miles of conduit that are to be laid, 40 miles have already been laid, and the remaining 20 miles will be completed within a short time. The company claims to have secured 5,000 subscribers, 80 per cent of whom are now using the local Bell service.

The Hudson River Telephone Company has strung two additional wires from Albany to Schenectady, N. Y., and four to Troy, to meet the demands of increasing business. New lines have been extended from Gloversville to Canada Lake and Mayfield, and the Amsterdam exchange has been connected with Minaville, Glen, Mill Point and Auriesville. A line is now being stretched from Broadalbin to Johnstown.

### United States Military Telegraph and Old Time Telegraphers' Association.

The sixteenth reunion of the United States Military Telegraph Corps and the Old Time Telegraphers' Association will take place at Pittsburgh, Pa., on September 9, 10 and 11. The official headquarters will be at the Monongahela House.

The programme for the meeting is as follows:

Wednesday, September 9.—10 A. M., business meeting of the Old Time Telegraphers' Association; 2 P. M., business meeting of the United States Military Corps; 8 P. M., entertainment especially arranged at Carnegie Hall; lecture by A. B. Chandler, Esq., New York.

Thursday, September 10.—9 A. M., excursion to armor plate and other mills, Carnegie company, Westinghouse Air Brake and Electric Works; 8 P. M., banquet.

Friday, September 11.—Visit to local points of interest in and around Pittsburgh.

### Schiff, Jordan & Company.

Schiff, Jordan & Company, of Vienna, have opened their own offices at 39 and 41 Cortlandt street, in charge of R. Straschnow and L. E. Frorup. They are now putting on the market their new carbon for direct and alternating currents. These carbons are high-class in every respect, and they have received very flattering reports from several of the large stations in this vicinity that have tested them.

## THE COX THERMO-ELECTRIC GENERATOR.

ABSTRACT FROM THE LONDON "ELECTRICAL REVIEW."

Clamond was one of the first to devote himself to the construction of thermo-electric generators on a large scale. He constructed a pile of 6,000 couples, from which he obtained an electro-motive force of 218 volts. He found, however, great difficulty in keeping the external junctions cool. He was not able to convert more than five per cent of the heat supplied to the pile into electric energy. These piles of Clamond also underwent rapid deterioration.

One of the most prominent workers in this field at the present day is Mr. Harry Barringer Cox. Mr. Cox is an American, and has devoted the last 20 years of his life to the evolution of a practical thermo-electric generator. After having studied all that was known about thermo-electricity in Germany and France, he returned to the United States, where he has since worked out and patented many improvements in the thermo-electric generator. So tireless and exhaustive have been Mr. Cox's labors in this field, that his patents may be said to contain the history of thermo-electricity for the last 15 years. Mr. Cox has now removed his headquarters to England, and has just built a fine laboratory at St. Albans, which is to be devoted exclusively to the study and development of thermo-electricity and the design of commercial types of his new generator. We had the pleasure recently of visiting this laboratory and inspecting Mr. Cox's latest achievements in thermo-electricity, and the following account of what we saw will, we think, show that Mr. Cox has produced an invention which may find a limited scope as a generator of electricity.

What Mr. Cox has chiefly aimed at is to increase the durability of the generator. How well he has succeeded in this may be judged by the fact that he claims to have had some of his generators in use for four or five years without any important falling off in their electro-motive force.

In the Cox generator, one element consists of an alloy of antimony and zinc, and the other of copper and nickel. A sufficient number of couples to form one ring or tier in the generator are cast together in a mould of peculiar construction. The mould is made in two halves, each half being a steel plate with pointed teeth on one of its edges. When the two halves of the mould are placed together, the teeth intermesh as in toothed gearing, and grip the short copper plates which form the positive elements between their bearing surfaces. The clearance left between the back of one tooth and the face of the tooth next following, forms the moulds or cavities into which the antimony alloy, forming the negative element, is cast. The ends of each copper element are bent round so as to lie across the ends of the cavities into which the antimony alloy is poured.

The fused antimony thus comes directly in contact with the copper plates, but this would not be sufficient to make a good joint if the metal were allowed to cool in the ordinary way. Since the fusing temperature of the antimony alloy is about 300 degrees, and of the copper 1,000 degrees, a strong welded or alloyed joint could evidently not be secured at the lowest fusion temperature.

Mr. Cox, in the course of his researches on the thermo-generator, found that one of the chief deleterious effects came from the imperfect junction of the elements, and he believes he has succeeded in overcoming this difficulty, and produced a true welded joint between the antimony and the copper by heating the steel moulds to a high temperature before casting, and maintaining them at this temperature for a considerable time thereafter. A gradual process of alloying thus takes place between the fused antimony and the copper at their surfaces of contact. A certain percentage of copper penetrates into the antimony, and a certain percentage of antimony into the copper. The stratum of metal which forms the junction of the two elements will vary uniformly in composition from that of the positive element at one side to that of the negative element at the other side. Mr. Cox considers that this circumstance has a good deal to do with the more efficient action of his thermo-electric couple.

The series of couples cast in one piece at each casting is bent round to form one ring or tier of the thermopile. Before this, however, each piece is carefully annealed, till the antimony alloy which, before annealing, could be easily broken by the fingers, becomes quite tough.

After annealing, each piece, containing the same number of couples, is tested for resistance, to discover whether the joints are good, and whether the annealing has been thoroughly carried out. If the resistance of any piece deviates from the standard by a small fraction, it is rejected; this deviation being taken as evidence of an imperfect joint, or some other mechanical imperfection. In Fig. 2 a pile of the couples ready for having their resistance tested may be seen piled up on a bench in the casting room.

Each length of couples is now bent into a ring, and a sufficient number of these rings are piled one on the top of another to form a pile of cylindrical shape.

Each cylinder is seven inches in diameter by five inches high. Each ring or tier of couples contains 15 couples, and, when heated by a Bunsen flame, gives an electro motive force of 1.2 volt and a current of four amperes.

It is not clear to us, however, whether this voltage is on closed or open circuit; if on open circuit, it is naturally much lower than 1 2 volts when a current of four amperes is passing. After a sufficient number of rings have been built up to form a pile, and all connections made, the whole is coated with a layer of glassy enamel. This preserves the couples completely from the corrosive and disintegrating action of the hot gases of the gas flame, and gives to the Cox generator its greater durability.

A tank or hollow casing is fixed round the outside of the cylinder in as perfect mechanical contact with the couples as possible, but at the same time thoroughly insulated from them by means of the enamel above referred to, and water circulating through this tank or casing keeps the outer ends of the couples cool. This casing may be small where the means of producing a constant circulation of water are available. Where that is not the case, a slightly larger tank is used; and recently Mr. Cox has made experiments with this type of generator, which show that the necessary cooling effect can be obtained with a tank of very moderate size.

The laboratory, which has been designed and recently completed by Mr. Cox, is probably the largest and most complete establishment in existence devoted solely to thermo-electric investigation. In the large central room are a stamping machine for stamping out the copper strips, which form one element of the couples, and a turning lathe, both being driven by an electro-motor.

In an underground chamber, beneath the floor of the large central room, is a large storage battery, capable of giving current at 112 volts. By means of a special switch the cells of the storage battery can be rearranged so as to reduce the charging electro-motive force to such a point that the cells may be charged by one of the Cox generators. In this way Mr. Cox stores all waste electric energy developed during testing and such like operations.

Besides the casting room and large central room already referred to, there is a private testing room, supplied with a complete outfit of the latest testing instruments from France, England, Germany, United States, etc.

Mr. Cox showed us a large generator three feet in height and 18 inches in diameter, which, he said, had been in continuous use for four or five years. Its output was stated to be 400 watts; namely, 10 amperes at 40 volts.

The battery of four generators, Fig. 3, has been fitted up as a type of what will be suitable for lighting a moderately-sized house. Of course, these batteries can be set up in pairs —three, four, or any number—depending upon the amount of work required of them. It consists of four cylindrical generators, each seven inches in diameter, and five inches in height. Each generator is capable, it is claimed, of producing a current of two amperes at an electro-motive force of .2 volts. The four generators, therefore, when connected in series, should develop two amperes at 48 volts, but here again arises the uncertainty as to whether the volts given were obtained on open circuit. Below the battery of generators is a battery of storage cells, which is connected up in parallel with the thermo-generators.

Each generator is excited by a Bunsen flame, which rises through the central aperture, and is deflected towards its sides by a series of metal disks, which increase in diameter from the bottom towards the top. The sides of this aperture or funnel are, like the rest of the apparatus, coated with enamel; the heat reaching the inner joints of the couples through this layer of enamel.

Gas experts have given Mr. Cox, as the result of their measurements, two and one-half cubic feet per hour as the consumption of a battery of this size, but we can only conclude that the meter used by the experts must have been very much at fault. The battery is kept going continuously, and while the current is not required for lighting or other purposes, it is stored in the storage battery.

It is interesting to compare the electro-motive forces of the couples of Markus, Clamond and Cox. These are taken from figures given without qualification of temperatures, and are presumably the maxima producible under working conditions. They are as follows:

| | |
|---|---|
| Markus | .05 volt. |
| Clamond | .036 volt. |
| Cox | .08 volt. |

Mr. Cox appears by his improved joint to have obtained 60 per cent more electro-motive force from his couple than Markus, and a still greater increase on that of Clamond. The metals used in Markus's couple were not very different from those in Cox's couple, so that the improvement must be entirely due to the welded joint produced by the latter. Of course, the Cox joint has another advantage in having a much lower resistance than the joints of previous thermo-electric generators, a fact which still further increases the amperage obtainable under like conditions.

Mr. Cox's experiments have led him to the somewhat heteredox conclusion that the temperature of the external ends of the thermo-electric couples may be varied within considerable limits without producing any important change in the electro-motive force. But the outcome of the labors of practical men have before now led to the revision of theoretical conclusions.

The Cox generator, we are informed, has already been successfully applied to telegraphy, and 10 lines of a telegraph company in the United States were operated for a period of two months at less than one-eighth of the usual cost, but there is probably some error here. We believe that these generators are also being tried by the postal authorities in this country.

There can be little doubt that the Cox generators may prove serviceable in certain applications, even though the cost of thermo-generators should be much greater than that which may be worked out from Mr. Cox's figures, concerning which, by the way, we disclaim all responsibility. Their durability, constancy of electro-motive force, freedom from general messiness and comparative independence of skilled attention must make them useful in cases where small installa-

tions are required. For installations in country houses, and other residences not within the reach of a central station, this thermo-electric generator promises to be superior to anything of its kind hitherto proposed. We wish Mr. Cox success in the development of his invention, and if in practical working he succeeds in realizing the results of laboratory tests, he will be looked upon as a benefactor by consumers of electricity, but until figures are forthcoming, based upon undoubted authority, we must reluctantly conclude that the development of electrical energy by Mr. Cox's method will be found somewhat expensive.

### How Much To Spend in Advertising.

[*Charles Austin Bates, in Printers' Ink.*]

Enough money should be spent in advertising a business to make sales. A business can't exist unless sales are made. They can either be made by advertising or they can not. Trial will tell. Trial will also tell how much money it is necessary to spend to make a certain number of sales. If you find that there is a profit left after you have expended the necessary amount, go ahead with the business. If there is no profit left, you had better close that business and go into something that will stand advertising.

The amount of money a man should spend in advertising depends very largely on how much business he is prepared to do and how much he wants to do. Advertising will sell anything that ought to be sold. That's a broad statement and perhaps some may take exception to it, but it can be figured out as absolutely truthful in every case.

### OUR CANADIAN LETTER.

BUCKINGHAM, QUE.—Messrs. Ross Brothers will place an electric light plant in their new saw-mills.

NEWMARKET, ONT.—The by-law to install an electric plant has been carried. Debentures for $10,000 will be issued.

PORT ARTHUR, ONT.—The Port Arthur Pulp Timber Company is being incorporated to manufacture timber and to construct electric light and power works. The capital stock is $200,000.

THREE RIVERS, QUE.—The city has sold its electric light plant to Messrs. Fregean and Sacroix. Their backer, it is believed, is a New Yorker. The new company will get their power from Batiscan River, from falls at Price's Mills. The current will therefore have to be transmitted 14 miles to the city. It is also proposed to supply neighboring villages.

J. A. C.

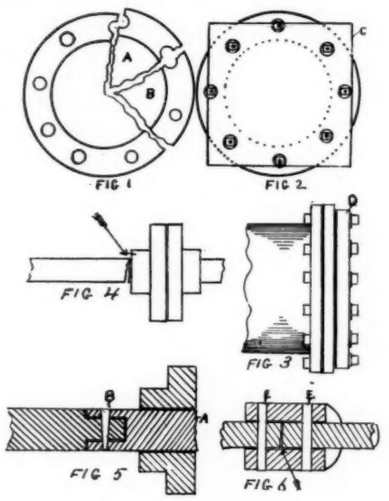
Montreal, August 31.

Messrs. J. Murphy, superintendent of police telegraph, Cleveland, Ohio, and W. F. Welch, superintendent of police telegraph, Buffalo, N. Y., are among those who will attend the first meeting of the Association of Police and Fire Telegraph Superintendents in Brooklyn, N. Y., on September 15.

### SHOP KINKS.

BY B. F. FELLS.

When I am called to a mill or shop and the proprietor shows me a machine or engine which is a "Jonah," as he says, owing to its making more trouble than any other machine in the mill, and at the same time that machine is made just the same as the others of the same kind; and if after I tinker at that machine for a while and find that upon adjusting certain parts correctly, setting a screw to rights here and there, and so on, and if after this the machine makes no more trouble in proportion than the other machines, I am driven to conclude that the aforesaid machine was given a bad name, because the men of the mill did not understand their business, and not that the machine itself was at fault. I may really be talking against my own interests when I say that many times when a company sends to the machine or engine-maker for an expert, the expense could have been saved if the company's machinists or machine-fixers had used a little judgment and had attempted to fix the trouble themselves. It is fitting to remark here, therefore, that many bills against firms for outside expert service could be avoided if the home workmen used more forethought. Recently a dispatch called me to a mill in which it was stated that the engine had "blown to pieces." I found upon examination that, practically, the only damage was the loss of a cylinder head, which was broken in three pieces, with several bolts more or less disabled. A view of the head with the detached pieces *a* and *b* is shown in Fig. 1. It was necessary that the works be kept running, so we made temporary repairs by putting in longer stud bolts and using a wooden plank securely bolted on as marked (*c*) in Fig. 2, which is the end view, and (*d*) in Fig. 3, which is a side view. In three hours later the machinery was driving along as usual. The application is this: My firm sent in a bill of $30 for expert services rendered, and I was away one day. This is all right, but why could not have the home machinist or millwright done the thing and saved the $30 for his employers? It might be well to state that the cause of this fracture to the cylinder head was a combination of an overloaded engine, an overworked pair of boilers and a blowing safety valve, which had caused the water in the boiler to lift; and the fact of the engine being so far below the boiler made the conditions all that could be desired for a first-class smash-up from water running into the cylinder. The patch of wood kept the engine going until Saturday night, when a new head was put on. I think that the local millwrights should give more time and attention to details. When I was inspecting a large power shop lately I found the reheaters useless, and the engineer said he did not dare to use them. Nearly all the steam-pipe covering was off and the lagging gone. A large valve, having a force of 100 pounds pressure to the square inch, or what is equal to about three tons on its face, required reconstruction, as leaks in all the joints had been created. One of the iron rocker arms was loose. The engineer said they must be kept running so that they can not be tightened up, and "We have got to take the chance of ruining them." Bits of wood and wire were found in frequent use for holding and supporting parts of the machinery. A large cam, which is the principal motion for working the valves, was patched with iron plate. One of the cylinder heads was found to be cracked, and the other cylinder head, it was reported, had never been taken off since the pumps were set up. There should be cut-offs provided so as to shut off the steam from any one of the engines. A new steam chest was also needed and so on. A plant in such shape will not do effective work. At every step we found some new outs. In taking out the pistons, one of the rings was found to be broken into a number of small pieces, and a new one was necessary. In trying to center the piston in the cylinder, the springs were found to be simply flat pieces of one-inch iron, untempered, and it was afterwards ascertained that the workman who made them had been instructed not to bother to temper them as it was a "cheap job."




"SHOP KINKS" APPLIED TO REPAIRING FRACTURES.

Often important jobs on mill shafts must be done quickly. I recollect a case when the shaft broke off next a coupling, as shown in Fig. 4. We fixed it in six hours by turning down the ends of the shaft and fitting the core into a prepared shell, as shown by A in Fig. 5. The key B served to hold the two together. Again, a shaft broke short off, and by putting the hub of an old pulley over the fracture and driving in keys E E, as indicated in Fig. 6, the works were stopped running but three and one-half hours. Of course, a new section of shaft was put in at the first opportunity.

GLASS BEARINGS.

They say that glass bearings are going to be used for machinery bearings. There is nothing so very new about this. Along in 18-0 I was situated at a mill which was equipped from top to bottom with the worst, old, worn-out machinery possible to imagine. We had to be constantly patching up broken and dilapidated parts of knitting machinery, until the machines were a sight. Of course, the journals were worn out, and here is where the glass bearings came in. It is customary to babbitt worn and uneven box journals, but one of the men discovered that glass could be melted and poured into the worn portions and fill them up to the proper level on the same principle. The glass also formed a good hard surface, so that there was less friction than formerly, and the bearing would work freer and require less oil. But glass bearings will not stand so much as iron. A defect in any part that contracts with the glass will soon grind the brittle substance to powder, and I would advise manufacturers to keep shy of glass bearings for a while, or at least until they are perfected. There are many better substitutes for babbitting metal than glass. Babbitt metal proper consists of two pounds copper, four pounds antimony and 48 pounds tin. A substitute for babbitt metal which gives good results is composed of 11½ pounds copper, 15½ pounds antimony, 47 pounds tin and one pound of yellow brass. These are melted together, and two pounds of tin for each pound of the mixture are added. When using the metal the boxes should be made quite warm; this will prevent the lining metal from chilling and blocking up its own passage, and will also modify to some extent the inevitable effects of shrinkage.

### New York Electric Lighting Companies Combine.

A certificate of the consolidation of the Manhattan Electric Light Company, Limited, and the Madison Square Light Company, of New York city, forming the Manhattan Electric Light Company, was filed on September 1 with the Secretary of State. The capital is $1,500,000, and the directors are R. R. Bowker, E. A. Leslie, H. M. Edwards and C. S. Shepard, of Brooklyn, and Frank Enos, of Englewood, N. J.

# Electrical Review

**Times Building, 41 Park Row,**

*P. O. Box 2339.* NEW YORK.

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REGISTERED CABLE ADDRESS:
"ELECTVIEW," NEW YORK.

1546 "CORTLANDT," TELEPHONE CALL.

Subscription to the
ELECTRICAL REVIEW.

One Year, United States and Canada, - $3.00
One Year, Foreign Countries, - - 5.00
Single Copy, - - - - - - .10

Copies can only be supplied for one year back at 25 cents each.


## Special Notice to Advertisers.

*CHANGES for advertisements must be in this office by Friday noon for the following week's issue.*

*NEW ADVERTISEMENTS should be in the office not later than Saturday noon to insure publication the following week.*

NEW YORK, SEPT. 9, 1896.

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It is encouraging to note that there is a good demand from Europe for our first-class traction bonds. A financial paper estimates that from $10,000,000 to $15,000,000 of these bonds will be sent abroad this Fall.

Pay out your money. Don't hoard. This country is all right. There is no better time than the present to pay bills that are properly due, and if you thus start your money in circulation it will come back to you through the medium of your own accounts receivable. The ELECTRICAL REVIEW is following this policy with its own accounts, and trusts that its patrons and everybody's patrons will do the same.

Horseless carriages are gaining in popularity in Europe. Considerable development in this field in the United States is expected in another year.

A well known Parisian engineer, who has been studying our street railways for some time, predicts that compressed-air motors will prove a failure. He also thinks that the trolley system is a better mode of locomotion. Thanks. It is pleasant to have an opinion respected and repeated.

At Bedford, N. Y., the successful operation of a burglar alarm recently was the indirect cause of the death of two burglars. Electricity is the most useful servant of man, and the end of its progress is not yet. The day may come when a burglar will be trapped by electricity so successfully as to cast a large damper on the burgling business.

A judge in a local court at Atlanta, Ga., has rendered a decision that the law of that State requiring separate cars for white and black passengers applies to street railroad cars. The decision was rendered in a test case brought in behalf of a colored man who was ejected from a car of the Atlanta electric railway for refusing to take one of the seats in the rear of the car reserved for colored people.

We have no doubt but that at the proper time an understanding will be reached between the American Bell Telephone Company and the Western Union Telegraph Company, by which these two powerful corporations will continue their amicable business relations. Of course, the expiration of the agreement in November next will cause a cessation of the good-sized payments the Bell company has been making to its one-time telephonic competitor.

Foreign correspondents have to earn their salaries, especially in the dull Summer season. One of the latest reports from abroad is that the Queen of Portugal, who is celebrated as a pursuer of the various fads of the hour, has been experimenting with the Roentgen rays. She has detailed the ladies of her court to serve as subjects, and has been making pictures of their skeletons. According to the report, it seems that these gave such an alarming insight into the distortion wrought by tight lacing that the female nobility of Portugal rushed to order gowns six or eight inches wider in their belt measure. Our guess is that it will require more than the revelations of a radiograph to bring the figure of the Venus of Milo into fashion.

### *ARE STREET RAILWAY TRANSFERS GOOD UNTIL USED?*

A police justice in Jersey City, N. J.. has laid down as his view of the law that a street railway transfer ticket is good until it is used. This opinion was expressed in the following case:

A Jersey City policeman, who the conductor says was intoxicated, was arrested for creating a disturbance on a car of the Consolidated Traction Company, of New Jersey. The disturbance consisted in the policeman's insisting that the conductor should accept as fare a transfer ticket issued two hours previously. The rules of the Consolidated Traction Company, under which transfers are issued to passengers, require that the transfer ticket shall be used within ten minutes after the passenger receives it, in order to be a valid fare. The police justice, after hearing the case and expressing his opinion as quoted above, discharged the prisoner and advised him to sue the company for damages.

We do not believe that this decision is good law, nor do we believe that such a ruling will be sustained by the higher courts. We think the Consolidated Traction Company owes it to itself and to the street railway fraternity in general to carry the case to a final decision.

When a passenger pays his cash fare it is tacitly understood between him and the street railway company that he is paying for and is entitled to one continuous ride. The issuance of a transfer ticket to the passenger is but an extension of this implied contract, and it is incumbent on the passenger to avail himself of the first car provided by the company to finish his ride. The transfer ticket stipulated the length of time for which it was good, and this was practically agreed to when the passenger accepted it. If, as alleged, the passenger was intoxicated, it was only through the courtesy of the company that he was permitted to ride in the first place, and his position as a defendant is all the more unstable on this account.

The question of three-cent street railway fares continues to be agitated in several quarters. Irrespective of other, and perhaps more important, aspects of the matter, this query suggests itself: How many more people would ride on street cars at three cents than now ride at five cents?

There ought to be many city waterworks systems throughout the country that could be adapted to furnish power for driving turbines to generate electric current. We look for a development in this direction.

### H. E. & C. Baxter's Affairs.

On September 1 the creditors of H. E. & C. Baxter, electrical supply manufacturers, of Brooklyn, N. Y., resolved that the assignee, for three months from date, be allowed to carry on the business at the present stand, completing the unfinished goods and disposing of the assets at private sale, according to his best judgment. On December 1 the condition of affairs is to be again submitted to the creditors and a definite proposition will be made, looking either to an immediate closing out of the business or to a reorganization or continuance.

The creditors present also unanimously agreed that a number of small claims, each under $50, and amounting in the aggregate to less than $500, should be paid in full out of the assigned estate. This will dispose of 40 small claimants and leave the firm's affairs virtually in the hands of 27 creditors having considerable demands.

The following is a statement of the firm's condition:

ASSETS.

| | Nominal. | Actual. |
|---|---|---|
| Finished goods | $4,890.98 | $4,056.73 |
| Tools and machinery | 11,505.41 | 7,558 75 |
| Patterns | 2,033.18 | 1,119.55 |
| Furniture and fixtures | 1,700.90 | 951.04 |
| Materials | 703.93 | 703.93 |
| Unfinished goods | 3,714.76 | 922 12 |
| Accounts receivable | 6,337.48 | 3,285.98 |
| Cash on hand and in bank | 16.44 | 16.44 |
| Patents | 10,500.00 | 2,000.00 |
| | $41,403.08 | $20,664.69 |

LIABILITIES.

| | |
|---|---|
| Direct | $33,206.88 |
| Contingent | 300 00 |
| Total | $33,506 88 |

### Pennsylvania State Street Railway Association.

At the meeting of this association, held at Altoona, Pa., on September 2, the following officers were elected for the ensuing year:

President, John Lloyd, of Altoona & Logan Valley Electric Railway Company, Altoona, Pa.

First vice-president Albert L. Johnson, Allentown & Lehigh Valley Traction Company, Allentown, Pa.

Second vice-president, Robert E. Wright, Allentown & Lehigh Valley Traction Company, Allentown, Pa.

Secretary, S. P. Light, Lebanon & Annville Street Railway Company, Lebanon.

Treasurer, W. H. Lanius, York Street Railway Company, York, Pa.

Executive committee, John Lloyd, B. F. Meyers, S. P. Light, John A. Rigg and E. C. Folton.

The place of meeting for the next convention is Allentown, Pa.

### A Large Conduit Contract.

The Lachine Rapids and Hydraulic Land Company, of Montreal, Canada, have just closed a contract with the National Conduit Manufacturing Company, Times Building, New York city, for a complete subway system, including 406,000 feet of cement-lined steel pipe. All the construction work on this contract is to be done by the National Conduit Manufacturing Company. The amount of money involved is about $100,000.

Invitations have been issued, under date of September 5, for the meeting of superintendents of fire alarm and police telegraph at the Clarendon Hotel, Brooklyn, N. Y., on September 15, at 10 o'clock A. M.

### Deleterious Effects of X Rays on the Human Body.

TO THE EDITOR OF ELECTRICAL REVIEW:

As considerable interest is evinced in the effects of the X rays on the body, allow me to report a case which has been under observation for the past two months. Early in July I undertook to locate a bullet imbedded in the head of M. L., of Eau Claire, Wis. The patient was warned that the experiment might result in a loss of the hair, but desired me to proceed. Exposures were made with the tube over the forehead, in front of the open mouth and just behind the right ear.

The difficulty of penetrating the skull necessitated prolonged exposures. No painful sensations were experienced by the patient during the exposures, but inside of 24 hours every spot on the head under the tube commenced to blister. In a few days the forehead was an angry sore, in all respects similar to a burn; the lips were badly swollen, cracked and bleeding; the inside of the mouth was so blistered that little food could be taken, and that little was necessarily in liquid form. The right ear was more than doubled in size, and appeared like an ear which had been badly frozen. The hair on the right side of the head is entirely gone. The patient was treated as for severe burns, but has not yet recovered.

This is one of the most noteworthy cases I have observed, and, as I believe, one of the earliest, the date of the experiment being July 8. The case is being watched with great interest by local physicians, and the one feature which is satisfactory to the patient is that two good pictures of the bullet were obtained, showing it about an inch beneath the skull and directly under the occipital process. Of the deleterious effects of the rays there can be no doubt.

FRED S. JONES,
Physical Laboratory, University of Minnesota.
Minneapolis, September 1.

### The Business Situation is Improving.

[*From the Boston News Bureau.*]

Every day now sees an improvement in the general situation. The causes operating to this end are many and varied, although, of course, underneath it all is a slow growth of confidence. The people of this country have economized until they have arrived at a point where they must buy. The gold arriving is dislodging domestic capital which has been hoarded, and gradually money is beginning to seek investment or is offered for interest. If the present improvement continues a short time longer it is more than probable that our industrial machinery will again be in full operation.

There is every indication that the great banking powers of New York are in the security market for big money. They have been assisted the past two days by the public, but whether this assistance is desired is not yet clear. Presumably a slow gathering strength is preferable to a boom that might invite liquidation and reaction.

### LI HUNG CHANG IN THE ELECTRIC CITY.

THE VICEROY VISITS THE FALLS AND TAKES A PEEP AT THE POWER HOUSE OF THE CATARACT CONSTRUCTION COMPANY—HIS INTERVIEWS WITH ELECTRICAL VISITORS AND RAILROAD MEN.

Li Hung Chang, the Viceroy of China, spent his last day in the United States at Niagara Falls, N. Y. He arrived there Sunday morning, September 6, in a magnificent special train provided by the Pennsylvania Railroad, under the charge of Mr. Geo. W. Boyd, assistant general passenger agent. The train was met at Rochester by Mr. Geo. H. Daniels, general passenger agent of the New York Central Railroad, who accompanied the party over his company's lines and saw that the distinguished visitor and large party were safely transferred to the special train on the Canadian Pacific Railroad at Niagara Falls Monday morning.

The Viceroy, as is his custom, questioned Mr. Daniels about the road, the cities it passed through, his age, salary, etc., and could not believe that the general passenger agent was not a large owner of the stock of the company.

"Don't hesitate to tell me," he said, "for I won't speak of it."

"But I don't own a dollar of the stock," replied Mr. Daniels.

"You don't look it," was his reply to the prosperous looking railway official.

The Viceroy thought the great Falls were a wonderful spectacle, saying they were "sublime." He paid a brief visit to the power house of the Cataract Construction Company and expressed a desire to know "just what electricity was." No one present enlightened him. He poked his cane at one of the revolving dynamos, and it was knocked from his hand and his bodyguard were greatly frightened, evidently thinking their master was injured. The handsome walking stick, a gift from Mrs. U. S. Grant, was secured, and the Viceroy, except a surprise, was not injured by his sudden curiosity respecting electric power.

During the day Li Hung Chang received a number of visitors, including the representative of the ELECTRICAL REVIEW, General Superintendent John N. Culbertson, of the Bell Telephone Company, of Buffalo, Assistant Superintendent Liesinger; and Mr. Herman S. Salt, of the Western Electric Company. Mr. Salt presented the Viceroy, on behalf of his company, with a pair of improved desk-set telephones, nickel-plated, with solid back transmitter. The Viceroy took great interest in the instruments, and asked many searching questions concerning them and the telephone business in general. He was informed that a long-distance cabinet set had been placed in his room, and if he desired he could talk to Chicago, Washington, Boston, etc. The distance greatly surprised him, and he was disposed to call up the Chinese Embassy at Washington, and was apparently provoked to find that his country's representatives did not have the improved long-distance instruments in their Washington office.

"They have only the same kind of instrument we have in Northern China?" he inquired. "We have a line there 60 miles long, but the construction is crude. I would like you to personally see that these instruments are safely packed," he said to Mr. Salt, "with full instructions, and if we like them we will order more from you. China needs improved instruments."

The Viceroy wanted to know if these telephones were the best that the richest men could buy, and on being told that neither Mr. Vanderbilt nor Mr. Astor could get better ones, seemed satisfied.

On being told that the owners of these telephones did not sell them in this country, he inquired closely into the management of the American Bell Telephone Company, its method of licensing its local companies, collecting royalties, etc., concluding with the inquiry, "Do you do this to make money."

"Yes," promptly responded Dr. Culbertson and Mr. Salt.

"That is good," was the reply as interpreted by Dr. Geo. Marks, the intelligent physician of His Excellency, who was acting as interpreter.

The Viceroy thought Mr. Salt was a very, very young man to represent so large a company, and said so several times. In all, he talked to the electrical men for an hour, the longest interview of the day.

Among other visitors welcomed by the Viceroy was Mr. W. J. Arkell, of *Judge*, and party, and Hon. Wm. Berri, of Brooklyn. He made them all sit down while he learned the age of Mr. Arkell, inquired of him about General Grant, and talked finance at some length. A gift to him from Mr. Berri of a gold spoon pleased him greatly, and in return he gave one of his visiting cards, consisting of his enlarged autograph printed in black on a sheet of very red paper about four by six inches in size!

Dr. Geo. Mark, who acted as interpreter, lunched with this party, and, although he had never been outside of China before, spoke the English language with ease, having been taught it by English teachers. The doctor is the Viceroy's physician, and uses the medicines of our country. His conversation is bright and expressive, and he stated that the entire delegation had greatly enjoyed their visit to the United States, nothing having impressed them more than our great railroad systems.

Replying to inquiries from the editor of the ELECTRICAL REVIEW, Dr. Mark said there were no trolley cars in China, very little electric lighting, and some old-style telephones in the port cities, but none in the interior. There is quite a system of telegraphy in portions of the empire.

## The International Congress of Electricians at Geneva.

We abstract the following from London *Engineering's* report of the proceedings of the recent International Congress of Electricians at Geneva, Switzerland:

### WATTLESS CURRENTS.

André Blondel sent a paper on "Wattless Currents in Power Distribution by Means of Alternating Currents," which, in the much regretted absence of the author, was communicated in abstract by J. Rey, of Paris. The paper treats the fairly well understood problems of idle currents very fully. The difference in phase existing between the volts and amperes of the generators and of the mains is, according to Blondel, one of the chief troubles we have to contend against when employing alternating currents. In order to simplify calculations, Dolivo-Dobrowolsky has first resolved the current in two components of the same period, the one in phase with the electro-motive force, the other at right angles to it; the former is the watt current, the other a parasitic, wattless current, which neither produces nor absorbs energy, and which is itself originated by anything giving rise to a lag, particularly when the alternating current produces a magnetic field, or charges electrodes separated by a dielectric or an electrolyte. The magnetizing wattless current which lags behind by $\frac{\pi}{2}$ forms the subject of the paper; the electrolytic wattless component is $\frac{\pi}{2}$ in advance, generally not troublesome in the distribution of power, and not further discussed here. In good transformers, the wattless currents cause a waste of from two to five per cent; in asynchronous motors, wastes of 25 and 30 per cent and more. If the circuit contains many apparatus under small or no load, the wattless currents increase rapidly. The difference between the electro-motive force at the origin U, and at the extremity of the line or feeder U′, is for a current I of impedance Z given, not by the algebraical equation $V' = V - Z I$, where V and V′ signify the potential differences, but by the geometrical equation $(U' = U - Z I)$. By this expression Blondel means that U′ forms the basis of a triangle, whose sides U and Z I inclose an angle $\gamma - \phi$, $\phi$ being the difference in phase, and $\gamma$ determined by the equation $\tan \gamma = \frac{K}{R}$, K being the impedance of the line. The wattless current diminishes the power of the generators, and causes the voltage to vary with the load; the voltage can be raised, but only at the expense of energy. This part of the paper refers to what Rey mentioned as the auxiliary machines we notice in installations, which, we are told, do nothing, as they do not charge the mains, but which, in reality, do everything. In biphase circuits, the wattless currents can so much increase the reaction of the one branch upon the other, that the advantages of the biphase system disappear.

As regards remedies and palliatives for transformers, we have to proportion the wattless currents, which can not be avoided, by providing substations, or, better still, primary feeders, and in keeping the number of transformers as low as possible; from this point of view special transformers for each consumer may be styled a barbarism. Asynchronous polyphase motors start under load, a great deal of energy being wasted in wattless currents, however; in monophase motors these losses became very large, as we have seen in the port of Havre and elsewhere. Synchronous motors do not start under load; but they appear on the whole preferable, whenever the conditions of starting leave us a choice. Compensation of the wattless currents in the mains has often been attempted by means of condensers; Blondel would prefer polarizers for this purpose, connected to the secondary terminals of the transformers. Over-excited synchronous motors not doing direct work have, as has been stated, also been applied with the same object; this point again speaks in favor of synchronous motors. To reduce the wattless currents in the alternators, the fields have been made very powerful, and the armatures have been constructed with little wire, so that the voltage varies little within the ordinary load limits. As such machines utilize the materials very imperfectly, other devices have been proposed. Leblanc combines the generator with an exciter turned in synchronism by a train of wheels, and excited itself by the current of the alternator; the author has himself suggested similar devices for automatic compensation of the armature reactions; these, however, would not lend themselves to asynchronous machines, which Leblanc's constructions would do. In order to suppress the idle currents in the motors, Leblanc has introduced capacity into the secondary circuit of the armature, and also turned a continuous current armature rapidly in fields alternating at the same rate as the currents to be generated. Blondel attains the same object by letting a special continuous-current circuit circulate round the secondary core. These proposals are acknowledged to be complicated, and would answer only for large machines which labor under other inconveniences. Blondel's paper does justice to all attempts, and comes to the conclusion that we need further research on good industrial condensers and polarizers, on induction motors excited by currents apart from those of the distributing circuit, and on alternators whose armature reactions can instantaneously be compounded, and whose mass is more fully utilized.

The discussion following immediately was almost confined to the term "wattless currents," for which Von Dolivo-Dobrowolsky, of Berlin, is held responsible. Mascart protested against the creation of words like watté and déwatté as not French; why not adhere to the *courant en quadrature?* The old school, to which he belonged, felt itself embarrassed by the reckless coining of new, often unnecessary, terms. His warning, with which everybody ought to sympathize on general grounds, was little heeded in this instance. Palaz and Hospitalier could not dispense with the term; self-induction had passed into French, and the terminology of a rising science had to enrich itself. Ferraris, the chairman of that morning, sided with Mascart; the English were satisfied with idle currents, and wattlos could not be received into the Italian language. Rey remarked that Blondel did not like the déwatté. Blondel has, however, himself something to answer for in this respect.

### HIGH-TENSION CONTINUOUS-CURRENT DISTRIBUTION.

René Thury, of the Compagnie de l'Industrie Electrique de Genève, met with a warm reception when he explained his system of distribution by means of high-tension continuous currents, of constant intensity, for connection in series. The system has, in various modifications, been adopted at Biberist, Brescia, in Geneva and Genoa, and at several of the installations which the members who took part in the week of technical excursions following the congress visited on their round, and we propose to deal more fully with the paper when describing the installations. The Biberist line has a length of 15 miles; in Brescia 700 horse-power are transmitted over a distance of 12 miles; up to 15,000 volts are employed. Thury claims that his lines are easily calculated and his switchboards simple; that the regulation of the speed of the motors answers well; the motors can easily be started; that the consumers can not use more current than they are entitled to; that the lightning trouble, which is very serious in many parts of Switzerland, has successfully been overcome, and that the high tension involves no danger. His machines stand on porcelain insulators, imbedded in cement or beton; the floors are asphalted.

Mengarini, the well known professor of Rome, opened the discussion with the remark that all advocates of alternating currents would have to retire, headed by Ferraris. They admired what they had seen at Geneva, but who would dare to touch any of these machines in rooms full of dust, flour and moisture? As regards the compensation of the impedance of the line, he had quite recently made successful experiments with condensers of great capacity at Rome. Others concurred that the Thury system was advantageous for short lines, but would not recommend it for long lines. Hillairet, whilst, of course, recognizing the advantages of alternating-current distribution, upheld Thury as regards the easy starting and great efficiency of his motors; their construction, moreover, the insulation of the coils and the arrangement of the collector rings, offered no difficulty. He knew many continuous-current motors that had worked for years in dusty mills.

Kolben, of the Oerlikon Works, referred first to Blondel's paper, which had taught us how to cure by artificial means what no longer caused serious trouble to the experienced constructor. Huge machines, with revolving parts more than 12 feet in diameter, were now built with a clearance of one-twelfth inch. The idle currents of transformers were little to be feared; the case was more difficult with generators, but we had now fields strong enough to allow of the switching in of powerful motors. He granted that polyphase motors were inferior in efficiency to continuous-current motors; but the difference of one or two per cent mattered little. Their starting was somewhat expensive, but they could accommodate themselves to excesses of load, under which the continuous-current motors would break down. Professor Hoor-Tempis, of Ganz & Company, agreed with Kolben. Liquid resistances were well suited for reducing the current fluctuations. He and Bláthy had employed condensers for suppressing the self-induction of the line eight years ago. But they did not find them suitable for very high charges; the best tension would be 4,000 or 5,000 volts. The adaptability of alternating motors to series work had often been doubted; in Vienna, however, they used many such motors, up to four horse-power, for lifts.

In reply, Thury said that he would not materially alter his plant at Genoa (Italy) if he had to rebuild it. Transformers were dangerous even if step-by-step transformation was adopted. He had observed that alternating sparks pass more easily than continuous current discharges of the same voltage. Polyphase motors had not given satisfaction in sugar works, where they were, indeed, being replaced by continuous-current motors.

### CONTINUOUS-CURRENT GENERATOR FOR THREE-WIRE SYSTEM.

The next paper, by A. Rothert, of the Elektricitäts-Actien-Gesellschaft, late Lehmeyer, of Frankfort-on-the-Main, had to be hurried, owing to the late hour. The three-wire system for electric lighting would be more popular still than it is, if it did not require two small dynamos instead of one large machine. The neutral wire could be joined to a third brush placed midway between the two others; such brushes are right in the field, however, and spark badly. Generators with two independent windings on the armature and two collectors in series had answered under certain circumstances. Dobrowolsky has connected two fixed points on the armature of maximum potential difference by a choking coil, and has started the neutral wire from the middle of this coil. The Allgemeine Elektrecitäts-Gesellschaft, of Berlin, with which Dobrowolsky is connected, and the Compagnie de Fives-Lille have introduced this type of generator. These devices did not, however, permit of keeping the tension of the two branches constant. The losses in both branches and in the armature varied with the load, and the exciter could influence the total tension only. The load on both branches has hence to be fairly equalized, unless we resort to main resistances. Two years ago Dettmar had designed a new type which had since been improved. Each pole is divided in two halves of equal sign, so that we get four poles, $N_1$ $N_2$ $S_1$ $S_2$, the third brush being placed between $N_1$ and $N_2$; the armature has two windings. With this arrangement the third brush does not spark. The armature reaction opposes the field in $N_1$ and $S_1$ and strengthens it in $N_2$ and $S_2$. $N_1$ and $S_1$ are opposite one another and feed the same line wire. If we, therefore, connect $N_1$ and $S_1$ in series, and the other two poles likewise, the tension in the branches will not vary with the load. The two branches, in fact, work independently of one another, and the one branch may even be left unexcited. This subdivision of the poles had previously been suggested by Müller, and, further, by Kingdon, who connected the two poles of equal sign, however, so that automatic regulation could not be attained. In the Dettmar-Rothert generator two successive poles have the same polarity. Larger machines are provided with $4n$ poles, the exciter coils of 1, 3, 5, 7, and those of 2, 4, 6, 8, being connected in series. When these dynamos were put to practical work, they displayed the unpleasant habit of undergoing a partial change of polarity. If we imagine that $N_1$ and $S_1$ are alone excited, the lines of forces tend to cross over to the neighboring poles. The difficulty was overcome by connecting for mutual excitation. The grouping is brush 1, pole $N_1$, brush 0, $N_2$, brush 2, $S_1$ $S_2$, brush 1; $N_1$ and $S_1$ are joined to 0 2, and $N_2$ and $S_2$ to 1 0. Thus connected, either branch tends to regulate the other, as a loss of volts in one branch diminishes the excitation of the other. These generators are now constructed in sizes up to 100 kilowatts; the large machines have eight poles and an armature wound for four poles, and turn at 450 revolutions. A 75-kilowatt generator, exhibited at Berlin, is said to run well with 400 amperes taken from one branch and 200 from the other.

### LONG-DISTANCE POWER TRANSMISSION.

A paper of this title, prepared by Charles S. Bradley (not C. E. Bradley, as printed in our first article), of New York, was practically taken as read.

The author was present, but did not speak—English was not heard at the congress—and the few words which Palez said just indicated the object of the author. Bradley advocates monophase transmission down to his transformers and polyphase motors, particularly for single-phase lighting systems and railway working with a single trolley. He first refers to the difficulties caused in alternating circuits by the interconnection between inductance and capacity. He would balance each capacity and each inductance locally, and for this purpose divide a line of, say, 150 kilometres in 30 sections, which could be compensated at a slight expenditure of energy, whilst the regulation would greatly be facilitated. He is aware that Silvanus Thompson made a similar proposal at Chicago with regard to ocean telephony, where he suggested placing condensers or induction coils at intervals between the two lines. In power transmission we had to do with one period only, so that the conditions were ideal for compensation. The second part of the paper concerns the phasing transformers, which Bradley brought before the American Institute of Electrical Engineers last Summer, and which were vigorously criticised during the discussion in September. The transformers consist of a simple section and a compound section in series with the former and with a condenser. Both are provided with various secondaries which, suitably combined, yield phase differences of 120 degrees instead of the original 90 degrees. This conversion of diphase into triphase currents, which Bradley finds best suited for motors, is effected after the manner of Scott and of Hunting; but Bradley winds his combined sections interlaced. In the Geneva paper he admits that his transformers would absorb five per cent more energy than ordinary transformers, and that they would cause 50 per cent more initial outlay.

PROTECTION OF OVERHEAD LINES AGAINST LIGHTNING.

On Saturday, August 8, R. Chavannes, of Neuchâtel, introduced this discussion on behalf of Denzler, who was unable to attend. The terrible thunder-storms, frequent in Switzerland, and the great heights which the lines reach, render the lightning question far more important than might be assumed in this country. Chavannes had observed that, on one circuit, always the lower wire was hit. While looking for an explanation of this peculiarity, he found other lines in which the middle or the top wires proved most endangered. There is generally some faulty spot; posts standing on water bearing clay were struck by preference. Condensers and bobbins had answered in many cases, not always. In continuous-current lines, he would like to connect the poles through water to earth, if that were always possible. The protection of alternate current networks was more difficult; interrupters and fuses should not be placed on spots which could not easily be examined. In St. Etienne a transformer had been struck, and a man touching the transformer afterwards been killed; the secondaries of transformers should be earthed.

Kapp, the chairman of that morning, drew attention to the information collected by the *Verband Deutscher Elektrotechniker*. In response to their invitation various firms and bodies have contributed reports on their experience on lightning arresters to the *Electrotechnische Zeitschrift*. Palaz mentioned that the Swiss Association and the Belgian Association of Electrical Engineers had issued similar invitations, and he hoped that the Congress would indorse this request for futher statistical material. This was, of course, done. In Switzerland, Palaz continued, there were two schools, one in favor of connecting everything to earth, the other, equally successful, perhaps, of insulating all machines. Thury remarked that he had not insulated at first, but his high voltages had naturally induced him to adopt perfect insulation throughout, and he believed in it. At Brescia, which, like his power plants in the Jura, was exposed to terrific storms, Barni had just introduced a protector which gave complete satisfaction. In principle this apparatus does not differ much from those manufactured by the Aliott and other companies, which recall American patterns; none of these devices seem to be patented. Barni brings the line to a block of carbon, from which the line at once branches off again. From the block four carbon pencils project downward, opposite four other pencils, also about one and one-half inch in length, fixed to an aluminum lever two feet long, pivoted below, and provided at its lower extremity with an armature playing over an electro-magnet, which is itself fixed on the upper plate of a metallic comb; the lower comb is finally connected to earth. The apparatus at once extinguishes any arc, owing to its great leverage and the lightness of the aluminum arm, and acts only when the current of the machine is short-circuited. The blowing of fuses had formerly frightened the people. The American plan of placing the arresters on the outside of the building, so that the men are not scared, does not appear to have found imitators.

Goerges described the protector which Siemens & Halske have adopted at Wynau one of the many interesting hydro-electric plants on the excursion programme. Two strong copper wires are bent somewhat like U, and placed near one another in such a manner that we have two fairly horizontal lower branches, two vertical branches, slightly diverging upward, and two upper, strongly diverging branches. An arc would form on the corner below where the distance apart is least, and be driven upwards, not only by the heat convection currents, as Chavannes had indicated, but also by electro-dynamic action. For this latter reason it is essential that the upper branch is fixed to the insulator bell, whilst the line is joined to a terminal on the lower branch. If the connections are reversed, the arc tends to creep down, and is not extinguished. Goerges also recommended the zinc-antimony alloy of Wurts for alternating-current circuits; a couple of cylinders of this alloy are all that is required.

Hillairet accentuated that the direct stroke was not so much to be feared as the indirect destruction produced by discharges in the far distance, which often traveled along the line. Combs should be of metals like iron and copper, and should have low impedance. The geological and topographical character of the district should be studied. He would insulate his machines.

## Armington & Sims Have Assigned.

The Armington & Sims Engine Company, Providence, R. I., whose creditors a few weeks ago agreed to extend its notes, has assigned, and all of its property has been placed in the hands of a committee of the creditors. The assignment is indirectly due to the insolvency of the estate of the late Henry C. Cranston, of Providence. The company is capitalized for $363,500 and was incorporated in 1883.

## FEED-WATER HEATERS.

ABSTRACTED FROM THE GOUBERT MANUFACTURING COMPANY'S NEW CATALOGUE.

What is a feed-water heater? Merely an appliance used for heating water before it is fed to the boiler, and its advantage lies in the fact that the heat utilized for the purpose is derived from some source of waste.

Two such main sources of waste occur in every plant where steam is the medium through which the energy stored up in the fuel is transformed into mechanical work.

The first of these lies in the heat that escapes with the gases of combustion, whose temperature must necessarily be higher than that of the steam in the boiler.

To recover a portion of this heat, a class of feed-water heaters, generally called economizers, has been devised. They consist of a series of pipes placed in a brick chamber forming an enlargement of the flue, between the boiler and the chimney. The water is fed through the interior of the pipes and abstracts heat from the waste gases, as the latter travel among these on their way to the chimney.

The temperature of these gases being comparatively high (although in a well designed plant they should not leave the boiler at more than 450 degrees Fahrenheit), the belief generally prevails that the feed-water can be raised by their means to very nearly the temperature of the steam. That such a belief is erroneous can be readily shown:

In good practice, with 22 pounds of air supplied for combustion and nine pounds of water evaporated per pound of coal, about two and one-third pounds of waste gases pass off for each pound of water fed to the boiler, and as the specific heat of such gases is only about one-quarter that of water, therefore each degree that the water is heated will lower the temperature of the waste gases $4 \div 2.33 = 1.72$ degrees.

In the case mentioned above, it would not be practicable to cool the gases more than 150 degrees, and the water temperature would be raised $150 \div 1.72 = 87$ degrees; that is, presuming an average initial temperature of 50 degrees, that of the water entering the boiler would be $50+87=137$ degrees, which exactly corresponds to results obtained in practice; a very fair result indeed, and although, according to Mr. Geo. H. Barrus, the cost of an economizer for, say, 1,000 horse-power of boilers would be about $8,000, the saving effected would represent a good dividend on the investment in cases where no other waste heat is available.

The other great source of waste we now have to consider, lies in the heat that escapes from the engine with the exhaust steam.

According to the celebrated English engineer, Daniel Kinnear Clarke, the most economical multiple expansion engines transform into work only 18 per cent of all the heat stored up in the steam leaving the boiler, and 82 per cent goes to unavoidable waste. The majority of engines utilize but about 10 per cent. We have there a large store indeed from which to heat our feed-water, and that in a medium of such convenient form as to permit the use of the simplest apparatus.

There is in steam a certain amount of heat which the thermometer does not show and which is called latent heat.

When one pound of water heated to 212 degrees changes from the state of water into that of steam under atmospheric pressure, it has to absorb, in order to effect this change, 966 units of heat, while the temperature of the steam as shown by the thermometer is still 212 degrees, the same as that of the water. This is the hidden or latent heat.

If we bring cold water in contact with this steam, it will condense it; that is, it will restore it to the state of water; but, before it can do so, the steam must part with that latent heat which will go to heat the cold water; and, inasmuch that each unit of heat will raise the temperature of one pound of water one degree, one pound weight of steam would add one degree to 966 pounds of water, or it would raise six pounds of water from 50 degrees to 211 degrees.

Therefore, as the exhaust steam is about 80 per cent of all that generated by the boiler, we only need to condense one-fifth to heat all the feed-water, and as the limit of temperature to which we can heat the water is the temperature of the steam, we can come as close to 212 degrees as the construction of our apparatus will permit.

## A Pine Boiler Plug.

Reading, the other day, of fusible plugs for boilers, called to mind an incident which is said to have happened several years ago in a place where an old-fashioned haystack type of boiler was in use, remarks a writer in *Cassier's Magazine*. On one occasion a rivet was blown out at a point difficult to get at for repairing, and as a makeshift the engineer put in a pine plug, driving it into the hole from the inside. It is not remembered how long this plug lasted, but, at any rate, it tided over an emergency. The plug, it was found later, burned off until the leakage through it was just sufficient to prevent further charring, and while it was in operation, no doubt, performed the part of a safety plug, for, had it become uncovered, it would, in all probability, have given way with quite as much celerity as the ordinary fusible plug.

## KIND WORDS.

"ENJOYED."

TO THE EDITOR OF ELECTRICAL REVIEW:

Our Mr. McKibbin is a subscriber to your valued paper, and it comes regularly to our office and is enjoyed by us all. REED & MCKIBBIN.

New York, September 1.

## Keep at It.

[*From Printers' Ink.*]

Ninety-nine per cent of successful advertisers are continuous advertisers.

## THE SHIFTING LINES OF INDUSTRIAL INTEREST IN ELECTRICITY.

ABSTRACT OF AN ARTICLE IN THE "ENGINEERING MAGAZINE," BY GEORGE HERBERT STOCKBRIDGE.

Science has its law of conformity no less than art and theology; but the only conformity it really insists upon is conformity to nature. The written laws, the creeds of science, when applied, for example, to a proposed invention, or a new problem of practice, are used against its claims to orthodoxy, or in opposition to a given likelihood only up to the moment of success. Improbabilities science may discuss, but it is dangerous for it to point out what is impossible. Till the critical moment, however, the scientific creeds operate just as strictly and coercively as the creeds of theology and art. And they are the only guide.

And yet the *perpetuum mobile*, should it ever come, would break no laws; it would make new ones. The outlaw would become the leader of the forces of order. That is the privilege of a power of nature and of human genius acting in harmony with natural law. They compel broader classifications—in science, immediately; in other departments, more slowly. We can not exclude Shakespeare from the list of tragic writers because Aristotle lived a few centuries too soon. If Spohr's "Calvary," or Beethoven's "Ninth Symphony," or Wagner's "Tristan und Isolde" are infractions of the canons, it is so much the worse for the canons. Once the steam injector is born, a law must be passed to legitimize it. You can not say, after the fact, that it is impossible for a steam vessel to cross the Atlantic.

But, while science must be hospitable, inviting every new fact and admitting it with unreserved welcome, there is a period at the beginning of every science when the difficulty is to distinguish the invited guests from those that have forced their way in. Facts that are not facts are reported by ignorant or careless observers, and, where all are more or less ignorant, it is hard to be accurate with the best will in the world. This is the age of fable, the nebular period before the vaporous expansions of fact have contracted and solidified. In this period, ignorance eclipses the body of the sun and leaves only the corona visible. Here the process of science is one of exclusion, of sifting, of selecting the kernel of truth from the mass of error. After that has resulted in the acceptance of a few facts and the construction of a preliminary theory, comes the other process of the admission of fresh facts and the gradual widening of theories and formulas.

A third stage of development has to do with the useful arts—the sciences as applied to the benefit of the race. The development of the sciences as such is based on discovery and classification; that of the arts on invention.

These shifting stages of progress and this last-recited distinction are defined in the history of electricity and magnetism with what seems to be extraordinary clearness. The fables appear to be peculiarly fabulous, as becomes the mysterious nature of the agents. From the same point of view, the determination and the formulation of the underlying laws were and remain unequaled—certainly unsurpassed—triumphs of scientific genius. And the world does not need to be told that the embodiment of the laws in labor-saving machinery during the present century has produced effects unapproached by any other class of inventions.

To speak of invention as the embodiment—the conscious embodiment—of known laws is to beg the question from those who will have it, that every great invention is really a discovery, but the facts of electrical history bear me out. Broadly speaking, the electrical arts have followed in time the period of inquiry and discussion concerning electrical principles. A source of energy that was a subject of speculation to the ancients has received its practical application to the service of man almost entirely within the past 70 years. The force of this statement is greatly modified by the circumstance that electricity, as we best know it, was practically first discovered in the year 1800. It remains true, however, that the earliest interest in it in each of its succeeding forms was a scientific interest, and that its laws were well established before the telegraph, the telephone, the dynamo, the electric light and the electric motor came into being.

The general situation may be stated thus: First, the great electrical inventions, which have made this known as the century of electricity, depend for their action on the electrical agent in the form of a current; that is, they go back to the last year of the last century, when Volta, after studying most zealously the phenomenon of the twitching frog's leg, noted by Galvani, invented the modern battery as an electric source. Second, the invention of a still more powerful source of electric current, as embodied in the modern dynamo-electric machine, was prefigured by Faraday's discovery already mentioned. Third, the greater portion of the epoch-making electrical inventions of the century have been embodied in apparatus made up of a combination of one or the other of these electrical sources with some form of electro-magnet. The part played by this secondary and servile element in the development of these great arts, inclines us to put the slave of the lamp before Aladdin in the building of the tower. Nothing else in science, outside of astronomy and biology, is quite so full of the beauty of adaptation as these services rendered by the electro-magnet to the telegraph, the telephone and the electrical transmission of power.

In the order of date the telegraph takes precedence. It came some 40 years after the first of its main constituent elements appeared, about half that time being required to find a tool for Volta's pile to work with. But, when, in the Winter of 1819-20, Oersted discovered that an electric current traversing a wire near a magnetic needle would cause a deflection of the needle, or when, a little later, Schweigger secured increased deflections by coiling the current-traversed wire about the needle, there was at hand a tell-tale instrument which had only to be connected up in circuit with a battery to serve perfectly as the indicator of a telegraph. The needle telegraph introduced in England in 1839, 19 years after Schweigger's discovery, was, considering the state of information on the details of construction, about as speedy a reduction of the telegraph to practice as could have been expected. To Henry, and later to Morse, the notion came of utilizing Sturgeon's electro-magnet (invented in 1825) instead of the Schweigger multiplier, and this electro-magnet, as improved by Henry and others, is the responding element of the American telegraph system to the present day.

The needle telegraph of Europe and the electro-magnetic telegraph of America held the field of electrical invention without a full-grown rival for a little more than 30 years. By the end of that time the telegraph in this country had passed through a marvelous development, and brought into existence a large public, interested in electrical affairs. The establishment of the first American electrical journal, about 1874, was an appeal to this public, and no other. It doubtless filled its office, but I regret to say that, among its exclusively electrical items, one would more frequently find notices of marriage between knights and ladies of the key than discussions of electrical resistance or magnetic lag. The prestige of having a special representative periodical belongs only to the earliest and the latest of the four great electrical arts of the century. There is still a telegraph weekly, though the original changed its name and its character with the rise of the later arts, and became a general electrical journal; and, since 1889, there has been a monthly devoted to the interests of the electrical transmission of power.

After the telegraph arose two giant electrical industries—the telephone and the electric light—and later still came the electric railway and other power transmission. The first, in its generally adopted form, was another combination of the electric battery and the electro-magnet, and the second was the first great successful application of the dynamo-electric machine to the world's work on a large scale. Of this, and of the third, I shall speak later on. The one that challenges comparison with its predecessor is the telephone. Morse and Vail had taught the electro-magnet to write; Alexander Graham Bell taught it to talk.

In its turn, the telephone did something so contrary to human experience as to awaken universal wonder at its accomplishment. The mere statement is enough. Nobody will contest it. The telephone was essentially a complete novelty. It will be well to bear these unique services of the telegraph and the telephone in mind, when we come to consider the shifting of levels, which has left them high and dry above the present scientific, and perhaps the popular, interest.

When it came to the electric light, the field was already occupied. The light was new, but it had and still has a strong competitor in the gas light. There was no such excellence as to make anything else unthinkable, though with the telegraph that was the case, while nothing has yet appeared capable of posing for an instant as a rival to the telephone. The electric light simply took its place beside other means of illumination, and claimed its share of the business. The problems were those of subdivision and distribution, mainly, and the commercial one of finding a place for the concentrated light of the arc. That all are satifactorily solved is evidenced by the present wide dissemination of arc and incandescent lamps.

The development of the electric motor industries, like that of the electric light, broke no new path. Good motors available for railway work and for running presses and other machinery were in existence long before the full growth of electro-dynamics were reached. Humanly speaking, the world could better have spared the incandescent lamp and the two-phase motor than it could the quick intercommunication by the written and the spoken word furnished by their predecessors on the throne of electrical pre-eminence. If there were no trolley, we would perhaps be traveling to Flatbush by horse car, or by steam, or possibly by compressed air; if there were no electric lights, we could do fairly well with gas; but what would supply the place of our office telephones, which enable us to talk with the business men of New York and a dozen other cities? and what would not civilization lose, should the electric telegraph become a lost art?

The growth of the telephone and the electric light side by side created an immense electrical public, forcing electricity into the foremost place among commercial enterprises on the one hand and among the sciences on the other. If there had been any doubt, however, about this being the age of electricity, it was totally dispelled by the advent of the electric motor and the employment of the electric current for the transmission of motive power. This is the latest and, in a sense, the greatest of the applications of electricity at the present time. Temporarily it eclipses in general interest all the other applications. The reduction of the giant power of Niagara to a few threads of flowing energy, for ease of transportation, and letting it loose 100 miles away to run a loom or a sewing machine, is scarcely less than a miracle, and it is no wonder the popular interest is aroused. The apparent disproportion between the actual performance and the insignificant means employed is a never-ceasing source of wonder. Apart from its comparative novelty, and the surpassing scientific value of the art, this is the secret of the present predominance of electric power transmission in technical literature and elsewhere. This, and one thing more: It is a rapidly growing art. There is as yet no sense of age or decay about it—of its having reached or passed its prime. On that claim to attention the electrical arts have each in succession held the place of honor.

I have spoken of the periodical literature of electricity. Naturally, the first purely electrical periodicals touched mainly on the telegraph, and grew rapidly in interest under the stimulus of the picturesque development of the telephone and the electric light. While those two arts were in the ascendant, the journals were occupied largely with accounts of new inventions and new installations of one or the other of these appliances. Broadly, the period extended from 1876 or 1877 to 1889 or 1890. Only since the latter dates have they distinctly receded behind the electric motor.

Still more noticeably does the trend of interest show itself in general technical or scientific periodical publications and in the daily or weekly press. Within the past six or eight years several of the daily newspapers have undertaken to give their readers a column or so a week of notes on electrical progress; and every one of the scientific magazines has an electrical department as a matter of course. In these newspaper columns, and particularly in the magazine departments, the call is now for notes or articles relating to dynamo-electrics or electro-dynamics. In the magazine offices it is difficult to secure any consideration for the most carefully prepared papers on the telegraph or the telephone. They want the latest thing in polyphase motors or the most authoritative statement about Tesla's high-frequency currents. The telegraph is out of date. The king is dead; long live the king!

The same story is told by the transactions of the learned societies. I happened to have before me the Transactions of the American Institute of Electrical Engineers for 1894. Barring papers on the electrical units, electric meters, and the like, which might relate as much to a battery current as to that of a dynamo, an analysis of the volume shows the following: There are five papers on polyphase apparatus or problems connected therewith; one on the electric

railway and two others suggested by the action of the electric railway currents on buried pipes or other conductors; five on dynamo-electric machines or armatures not included in the articles on polyphase currents; one on the theory of the synchronous motor; one on a certain type of incandescent lamps, and one on the general subject of the subdivision and distribution of artificial sources of illumination; one on lightning arresters and recent progress in means for protecting against lightning; one on the electric brake, and several other miscellaneous papers, but not one on a subject directly connected with the telegraph or the telephone. The Transactions of the same learned society for 1893 and for 1895 show the same absence of discussion respecting the two subjects last named, and, I may add, the same putting forward of the problems and accomplishments of the larger electrical machinery; and there is no repetition of the sporadic reference to lightning protectors, as there was in 1894. Electric lighting itself had long been practically dead matter in the scientific printing offices, till Mr. McFarlane Moore's recent experiments gave it a new impetus.

An instructive light is thrown on the shifting of relations in electricity by such a search as one is called upon to make in determining the validity of an electric patent, particularly in one of the older electrical arts. The prior art nearest to hand, and nearest, commonly, in time, is contained in the American and foreign patents. In general, they are first consulted. Back of them, or concurrent with them, the scientific periodicals, the volumes of transactions and the book and pamphlet literature. As one goes backward in the search, one notes an increasing proportion of disclosures in the literature of contrivances not found in the patents, while, on the other hand, the proportion of inventions described in the periodicals and transactions as compared with the scientific disputations gradually falls off.

Starting from the other end of the circuit, we find the electrical literature of the early part of the century quite saturated with the controversy over the contact and the chemical theories of the voltaic battery. Slowly, opinions on the scientific questions became fixed, and by just so much the growth of invention was apparently quickened.

This aspect of the case suggests one noteworthy shifting of the lines that has taken place inside the mysteries themselves. The character of the very priests of the cult has undergone a change. The scientific investigator has become an inventor. Experiments are now made with locked doors and with an eye out of window toward the patent office. The most famous "laboratory" in this country is Mr. Edison's factory, equipped with the most perfect contrivances for quick model-making under conditions of secrecy. Nothing invidious is meant by this. It is the spirit of the time. It accounts for the changes noted in the comparative amount of space given to pure science in the literature of earlier times and of to-day. Notably it accounts for the fact that, of late years, the earliest information about an invention is likely to be found in the patents. Great commercial interests might suffer were it otherwise. The traditions of science are preserved chiefly among the schoolmen, or such inventors as were formerly connected with the schools; for the commercial instinct has invaded them also, and dragged forth some of the brightest and best to the factory. It works better that way than it does in the reverse process. On this point I have expressed myself elsewhere in terms which I venture to quote here:

"Scientists often become inventors, but inventors rarely become scientists. Out of the large number of electrical inventors—some of them of great prominence—who have obtained their knowledge of electricity mainly from practical experience in the workshop, it would be hard to select a single example of a man who has added to the general knowledge of electrical laws and principles. This function is confined almost exclusively to those who are or have been laboratory workers. It may be stated broadly that the only electricians who are now devoting their attention seriously to the formulation of electrical science as such either are or have been schoolmen, and most of them bear a title indicating the teacher."

All this hints at vastly altered conditions of work for the modern scientific student—at opportunities gained, shall we say, or lost? Gained, no doubt, in the mass; but surely some ardent searcher, now and then, would have given us more of his best work, had he not been jolted out of his natural bent by the irresistible march of the inventive spirit. Meanwhile, if it be true that the hope of advances in electrical science rests with the schools, it is thence also that future electrical inventions shall come. Not directly, but by virtue of the expansion of science which historically has preceded the rise of the arts hitherto. A new science, a new group of arts. Is it that the science of galvanism, so-called, is exhausted that it breeds no new sons? And is our increasing knowledge of the polyphase and high-frequency currents soon to give us a perfected science in that direction? The answer to these questions may furnish some hint as to the shifting lines, if such there are to be, of electrical development in the future.

### American Street Railway Association.

A meeting of the local committee in charge of the arrangements for the meeting of the American Street Railway Association was held several days ago in the Auditorium Building in St. Louis, and the apportioning of spaces for exhibits was made. The building in which the association will gather is the one constructed for the recent Republican Convention, and will afford more than sufficient room; in fact, it is the plan to use the central ground portion for exhibits and to hold sessions in one of the corners of the vast building.

### Western Electric Company vs. Standard Telephone.

The Western Electric Company has brought suit against the Standard Telephone Company in the United States Circuit Court for the western district of Wisconsin, for the alleged infringement of the following patents: Nos. 256,258, 309,617, 303,714, 299,926, 27,522, 28,266. These patents cover telephone connections, bell apparatus, switchboard appliances and general office mechanism, upon all of which the American Bell Telephone Company holds unexpired patents.

The *Inland Printer* for September is a good number, although the cover design is not up to the usual standard of excellence.

## ITEMS OF INTEREST.

Work on the electric railroad at Springfield, Vt., is being pushed with all rapidity possible, and it now looks as if by the first of October cars would be running.

The work of equipping the North Woburn, Mass., Street Railroad with electricity is nearly completed, and the company expects to have the line running with the new power in about a week.

W. W. Rider has been appointed general superintendent of the Central Union Telephone Company for Indiana. He succeeds John M. Baker, who goes to Davenport, Iowa, to take charge of the Iowa Telephone Company.

Four of the 20 new motor cars ordered last Spring for the New York & Brooklyn Bridge will be received this week. The building of the new electric power house is progressing and the foundations are almost completed, and the new station will be wholly completed by October 1.

The Electric Appliance Company, of Chicago, are meeting with large success as agents for the Boudreaux dynamo brush, which is increasing in popularity as a commutator-saver: It is composed of thin sheets of non-sparking, anti-friction metal, which takes up the current with the least possible amount of friction and wear.

The South Covington and Cincinnati Street Railway Company has been asked to appear before the Board of Administration of Cincinnati and there to discuss with the board the matter of a three-cent fare from the river up to Fifth street. There is in existence an ordinance providing for this rate of fare, though a previous ordinance does away with the idea that has become current, that the Covington company must give transfers to the cars of Route 9.

### The Goubert Manufacturing Company's New Catalogue.

A remarkably handsome catalogue has just been issued by the Goubert Manufacturing Company, 14 and 16 Church street, corner of Cortlandt, New York city. It describes and illustrates in detail the well known Goubert water-tube feed-water heater. In addition, the catalogue contains a great deal of valuable information on feed-water heaters and their uses in general. Every steam-user should have a copy of this catalogue in his hands. It is sent free on request.

### Newark Electric Light and Power Company.

The Newark Electric Light and Power Company supplies the whole of the city of Newark, N. J., with electric light and power. The company operates 15 Brush 125-light arc machines, 10 Brush 85-light arc machines, three Westinghouse 5,000-light generators, two Westinghouse 2,000-light generators, one Westinghouse 1,500-light generator and one 1,500-light Slattery alternator.

Belmont, Mass., has voted to purchase the local electric lighting plant.

## ELECTRIC LIGHT FLASHES.

Pawtucket, R. I., has voted against the establishment of a municipal electric lighting plant.

The Chester, Pa., Electric Light Company is supplying current from its handsome new station.

Another boiler will be installed in the city electric lighting plant at Jacksonville, Fla.

The Baltimore & Ohio Railroad will equip its new locomotives, now being built for the Royal Blue service, with electric head-lights.

The Bellevue, Ill., City Council has awarded the contract for installing the new municipal lighting plant to a Lincoln, Neb., firm.

Colorado Springs, Colo., proposes to use 6,000 horse-power now going to waste in its waterworks system to generate electric current.

Work has been commenced on the electric light system at Croswell, Mich., and it is expected the plant will be finished in about six weeks.

Arrangements have been completed for the placing of a large electrical plant at the Little Sur River, 24 miles down the coast from Monterey, Cal.

The work of laying the conduits under ground in Washington, D. C., for the Potomac Electric Light and Power Company is making good progress.

The Woburn, Mass., Electric Light Company will furnish power for the North Woburn Electric Railway, a new engine and generator being put in for that purpose.

The proposition to bond the village for a municipal electric lighting plant was recently defeated at Dexter, Mich., and the council will now probably enter into a contract with an outside company to do the work.

Manager Alex. Dow, of the Detroit Edison Illuminating Company, says there will be no consolidation of the different electric lighting companies in that city, so far as the Edison company is concerned. The Edison company has reduced its rates and the other companies have followed suit.

The Westinghouse Electric and Manufacturing Company is building four 1,500-kilowatt generators for the Allegheny County, Pa., Light Company. Each generator will weigh 90 tons. The base is cast in two sections, each weighing 56,000 pounds. The armature is 16½ feet in diameter.

Reference was recently made in the ELECTRICAL REVIEW to the application of the St. Anthony Falls Water Company, of Minneapolis, made to the Council Committee on Ordinances of that city, in which permission was asked for the privilege of laying conduits, stringing wires and electric poles and masts for the purpose of carrying a current of electricity for heating, lighting and power in Minneapolis. The application has received favorable consideration from the committee, and work will be commenced shortly.

# ADVANCE INFORMATION

**Valuable News and Tips for Manufacturers and Dealers.**

**We publish below information relating to new electric railways, new electric light companies, new telephone companies and projected electric construction of all kinds. Every reader will find these columns of special interest, and manufacturers and supply houses will receive many valuable suggestions looking to new business by carefully watching this department in the ELECTRICAL REVIEW.**

### Electric Light and Power.

JACKSONVILLE, FLA.—Address the Mayor concerning additional boiler for the electric light plant, for which $5,000 has been appropriated.

PENSACOLA, FLA.—The Citizens' Electric Light and Power Company has bought the plant of the Pensacola Electric Light Company, and will continue the operation of same.

ST. PETERSBURG, FLA.—A movement is on foot to erect an electric light plant.

WAYNESBORO, GA. — Address S. Bell, Mayor, concerning erection of new electric light plant.

BAMBERG, S. C.—Address H. J. Brabham, Commissioner of Public Works, concerning issuance of bonds for the erection of an electric light plant.

SISTERSVILLE, W. VA.—The Fort Wayne Electric Light Company, of Fort Wayne, Ind., will ask for a franchise for erecting electric light plant.

LOS ANGELES, CAL.—Los Angeles Water, Electric and Power Company has been incorporated with following directors: C. E. Brooks, W. H. Shinn, W. W. Everett, G. W. Bentley, A. E. Bagley, A. A. Stoiber and L. Friel, all of Los Angeles, to construct dams, reservoirs, ditches, tunnels, lay pipe, to create power. Capital stock, $3,000,000.

GREEN BAY, WIS.—Electric light plant in Ontagon, Mich., destroyed by fire.

FERNDALE, CAL.—The Ferndale Electric Light Company has been incorporated with following directors: W. D. Campbell, J. A. Shaw, C. H. Boynton, W. S. Wright and C. T. Schreiner, all of Ferndale, Humboldt County. Capital stock, $10,000, of which $3,000 is subscribed.

NEVADA, MO.—A light and power plant will probably be established.

FAIRFIELD, IOWA— The electric light plant was damaged by lightning.

WINONA, MINN.—The Winona Railway and Light Company has been incorporated.

CLEVELAND, OHIO—The Bradley Electric Light, Heating and Power Company has been incorporated, with a capital stock of $100,000. The incorporators are George Lillis, John C. Burgess, S. H. Holding, M. W. Neal and Frank S. Masten.

KALSO, WASH.—A company is being organized to put an electric light plant at this place, and a system of waterworks will soon be established.

LOS ANGELES, CAL.—An electric light and power plant will be put in by Witmer Brothers & Company.

BALDWINSVILLE, N. Y.—Baldwinsville Heat and Light Company has been incorporated; capital, $20,000. Directors: William F. Morris, James W. Upson, William H. Wells and John T. Wilkins, of Baldwinsville; William H. Hoffman, of Stiles; Bartlett Smith, of Syracuse, and John W. Stearns, of Akron.

ELKHART, IND.—The plant at this place has passed to the ownership of Carroll Collins, of Chicago.

SYRACUSE, N. Y.—Central City Electric Light and Power Company has been incorporated. Capital, $125,000.

NEW LONDON, WIS.—New London Electric Light Company has been incorporated by J. M. Jelleff, J. L. Haile, Bessie C. Jelleff. Capital stock, $15,000.

MISSOULA, MONT.—An electric light plant is to be established at Quigley.

CANTON, PA.—Canton Electric Light Company has been incorporated with A. D. Williams, treasurer. Capital stock, $8,000.

DUNMORE, PA.—Dunmore Electric Light, Heat and Power Company has been incorporated by P. D. Manley, M. J. Murray, John Carney, Thomas Mullen, A. T. Irvin and Margaret Brown.

NEWBERRY, S. C.—James McIntosh, Commissioner, may be addressed for information concerning construction of electric light plant, for which bonds will be issued.

ATHENS, ALA.—Address the Mayor concerning erection of electric light plant.

ST. LOUIS, MO.—Charles Sutter and others have obtained franchise for electric light, telegraph and telephone systems.

OGDEN, UTAH—Pioneer Electric Power Company, C. K. Bannister, chief engineer, will erect new machine shop.

KINSTON, N. C.—J. B. Temple, Mayor, is inviting estimates for an electric plant of 400 incandescent and 35 arc light capacity.

GRENADA, MISS.—James Pryor & Company are interested in proposed electric light plant.

SACRAMENTO, CAL.—The Capital Gas Company has been awarded contract for lighting the court house with electricity.

BALTIMORE, MD.—The Evergreen Improvement Association, of Evergreen, has been formed. It will construct an electric light plant.

FERGUSON, MO.—Olive Branch Electric Light Company has been incorporated by G. W. Downs, J. T. Ashbrook and O. F. Downs. Capital stock, $50,000.

### New Electric Railways.

JOPLIN, MO. — All the electric railways have consolidated, the Southwest Missouri Electric Railway having purchased the property of the Joplin & Galena Electric Railway Company.

CONWAY, MASS.—Work has begun on the extension of the electric line across the Deerfield River near Conway station.

DETROIT, MICH.—Work is being rapidly pushed on the suburban electric line from the terminus of the Michigan avenue line to Dearborn.

HAGERSTOWN, MD.—The electric line between this place and Middletown will be put in operation shortly.

WOBURN, MASS.–Early next Spring a company will be organized to construct an electric railway from North Woburn to Wilmington.

BUFFALO, N. Y.—The scheme of building a trolley railway along the lake shore has been revived. This time report says it will begin at Lewiston and end at Lyons.

NEW YORK, N. Y.—The Staten Island Electric Railroad Company is about to construct a new interior line across the Island. The line will branch off from the Richmond turnpike at Silver Lake, through the property of the New York & Staten Island Land Company, along Forest avenue to Cherry lane and Washington avenue, in Northfield, to South avenue and Richmond terrace, having its terminus at the Elizabethport ferry. The contracts have been signed and construction will be begun at once.

TORRINGTON, CT.—A company of capitalists has been partially organized for the purpose of building a trolley line from this place to Unionville, passing through Harwington Center.

WAKEFIELD, R. I.—William C. Clarke, of this place, is the head of the project to build an electric railroad from Wickford to Westerly. The plan as now proposed provides for the building of an electric railway, to be known as the Sea View Railway, from Wickfork to Westerly, following the shore.

ANN ARBOR, MICH.—Ann Arbor & Ypsilanti Electric Railway Company has been incorporated with a capital stock of $100,000.

SAGINAW, MICH. — The Rapid Transit Railway Company has obtained franchise for the extension of its electric railway.

PEORIA, ILL.—The Glen Oaks & Prospect Heights Electric Railway has been granted permission to build a new road.

STAMFORD, CT. — A continuous trolley line between this city and South Norwalk is assured for the near future, and it is expected that it will be running before Winter. A gang of men are now at work extending the tracks of the Stamford Street Railway Company to Noroton River, at which point they will connect with the line of the Norwalk Tramway Company. The latter company is making preparations to connect, and it is believed the tracks will be laid across the river by October.

### New Telephone and Telegraph Companies.

WILMINGTON, DEL.—The Delaware Telephone Company, of this place, has given the required security of $20,000 for the use of the streets, and will at once begin preparations for constructing its lines.

GALVESTON, TEX.—A charter has just been granted by the State department to the United States Telegraph and Telephone Company; capital stock, $1,000,000. The incorporators are A. Frenkel, A. B. Sowdon, H. H. Williams, Charles Frenkel and R. P. Lyon.

SCHUYLKILL, PA.—The Schuylkill Telephone Company, which is to introduce the new telephone system in this county, has awarded the contract for the construction of its system to Savage & Wertes, of Sunbury. The company will have its system connected with that of the Shamokin Valley Company and the Northwest Branch Company, of Sunbury, which will make direct connection with Williamsport and Scranton.

FRANKLIN, IND.—A franchise has been granted for a telephone system to Ferd. R. Strickler, of this city. The franchise gives free use of streets for a period of 25 years.

WATERVLIET, MICH.—Watervliet and Paw Paw Lake Telephone Company has been incorporated, with a capital stock of $300.

### New Manufacturing Companies.

TURNERS, N. Y.—The Star Electric Lamp Company has been incorporated by John Silver, of New York city; Richard R. Moffatt, of Brooklyn; George W. Mills, of Elizabeth, N. J., and others. Capital stock, $50,000.

DENVER, COLO.—The Cammett Mining, Electric and Amalgamating Company has been incorporated by Ira A. Cammett, George W. Angel and Henry Michael, to do business in Colorado; headquarters in Denver. Capital stock, $100,000.

NEWARK, N. J.—The Electric Chemical and Storage Battery Company has been incorporated. The company will manufacture and deal in electrical and mechanical devices and exploit electro-chemicals and other processes. Business will be conducted in Belleville and other places. The capital stock is placed at $100,000. The incorporators are Sigmund Rosenblatt, of New York, and Rufus N. Chamberlain and Albert S. Hubbard, of Belleville.

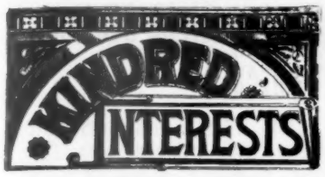
### Business Troubles.

SYRACUSE, N. Y.—Andrew C. Cornwall has been appointed permanent receiver of the Alexandria Bay Electric Light and Power Company.

BROOKLYN, N. Y.—The Kings County Elevated Railroad Company, capitalized at $4,750,000, has gone into the hands of a receiver. Gen. James Jourdan, the president of the company, on the consent of all parties interested, was named receiver.

### Increase of Capital.

CLEVELAND, OHIO—The Adams-Bagnall Electric Company has increased its capital stock from $150,000 to $225,000.




**John Simmons & Company,** 106-10 Centre street, New York, have perfected a new railway bracket which is made with malleable fittings.

**The Phœnix Interior Telephone Company,** of New York, have just forwarded a large shipment of exchange instruments to Venezuela.

**Rumsey & Company,** Limited, Seneca Falls, N. Y., have issued a new catalogue of power pumps, which will be sent to any one free on application.

**The Russell Electric Manufacturing Company,** Providence, R. I., are manufacturing an extensive line of arc lighting specialties and are making a specialty of mast-arms, cut-outs and hoods.

**The American Electric Heating Corporation,** 03 on, report a steady growth in this new and practical line of applied electricity. General Manager James I. Ayers has just returned from an extended western tour.

**C. M. Walls & Company,** 44 Lagrange street, Worcester, Mass., have placed on the market a novel and practical mast-arm for arc lights. This form of mast-arm has been adopted by the Worcester Electric Light Company.

**The American Electric Heating Corporation,** of Boston and New York, have established a branch office in the Monadnock Block, Chicago, under the management of F. P. Luther, formerly manager of the Western Electric Heating Company, at St. Paul.

**The Tesla** high-frequency coils for Roentgen-ray work, made by the L. E. Knott Company, 14 Ashburton place, Boston, have produced excellent results, according to the experiments of leading laboratories and hospitals, and in the demonstrations it is said that action of the heart can be shown with this apparatus.

**The Standard Theater,** of New York, Mr. William Sells, proprietor, is one of the best places in this city to see the results of artistic and effective use of the electric light. The numbers of Murphy and Loie Fuller are particularly attractive in this respect. The high-class vaudeville now being presented at this beautiful theater owes much of its success to the use of the electric light.

**The Bernstein Electric Company,** of Boston, are splendidly equipped in the commodious new building on Congress street for the production of the standard Bernstein incandescent lamp. The line includes series lamps of all currents and candle-powers, multiple lamps of all voltages, candle-power and efficiencies and a general line of fittings, street fixtures and sockets. The company are now under the general management of Mr. Bradley.

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**FOR SALE CHEAP.**

20-K. W. 110-Volt DYNAMO, good as new, and in perfect order.

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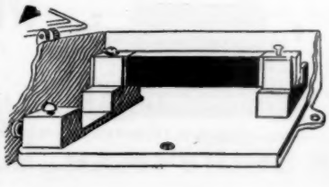

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# ELECTRICAL PATENTS

[Specially reported for this journal by E. S. Duvall, solicitor of patents, Loan and Trust Building, Washington, D. C. Copies of any patent may be secured for 10 cents each.]

ISSUED SEPTEMBER 1, 1896.

566,760 Electric switch; J. L. Hornig, St. Louis, Mo.

566,762 Village or house telephone system; E. G. Hovey, Chicago, Ill.

566,784 Selective system; A. L. Merrick, Springfield, Mass.

566,786 Electric railway system; J. M. Murphy, Danbury, Ct.—The sectional conductors, the main line, the laterals having cut-off devices and the pivoted lever mechanism for shifting the cut-offs, the grooved rail sections, and the presser rods passing down through said rail sections and connected with the shifting lever, and having head portions fitting and movable in the groove in the rail, and normally held from projecting above the tread-face of the said rail-sections.

566,795 Electric heater; F. L. Pruyn, Albany, N. Y.—An insulating support, pins provided upon said support on one side, a spirally coiled conductor encircling said support and passing around said pins, and auxiliary pins situated between the convolutions of said conductors.

566,800 Magnetic traction apparatus for motor cars; W. Robinson, Boston—A car axle and its wheels, a motor arranged to drive the same, and coils of insulated wire surrounding the hubs of said wheels, exterior to the surface of the latter, and arranged to magnetize the same, said coils being electrically connected.

566,801 Electric railway system; W. Robinson, Boston.

566,829 Toll board apparatus for telephone exchanges; V. Wietlisbach, Bern, Switzerland - Two switchboards upon which different telephone lines terminate, an electro-magnet in a line at one switchboard controlling a local circuit, including an annunciator at each of the switchboards, and means for extending a connection from the line having the electro-magnet to the line upon the other switchboard, whereby the signal for disconnection is received at both switchboards.

566,860 Electrical construction, regulation and distribution; T. H. Hick, Detroit, Mich.—Two sources of electricity and two work circuits, each work circuit having two main line conductors, one main line conductor of one circuit being joined to one of the main line conductors of the other circuit by branch wires, thereby throwing the two work circuits in linear-series circuit with each other.

566,874 Electric-distribution machine; W. E. Sinclair, Milwaukee, Wis.—Comprises an automatic quick-break knife switch for incorporation as part of an electric circuit, a power shaft, a counter shaft, a switch closing cam on the counter shaft and a reducing gear in train with the shafts.

566,887 Detector for railway switches; W. H. Berrigan, Jr., Brooklyn, N. Y.

566,889 Electric motor; J. Bram, Decatur, Ill.—An armature having radial posts or projections near each end, flanged and slotted bobbins wound with coils and adapted to be removably seated longitudinally of the armature on the said posts or projections.

566,892 Regulating socket for electric lamps; C. A. Chute, Chicago, Ill.

566,896 Electrical selecting instrument; A. Duppler, Jersey City, N. J.

566,914 566,915 Electric selector; A. Le Blanc, New York, N. Y.

566,916 Selecting device; A. Le Blanc, New York, N. Y.

566,917 Electrical transmitting instrument; A. Le Blanc, New York, N. Y.

566,918 Electro-magnet; A. Le Blanc, New York—An outer casing, a core inclosed within said casing, both of magnetizable material, two coils wound between them, one at each end and separated from each other, thereby forming a double magnet, one at each end, with a movable plate-armature at each end of said core and casing, and constructed to register with and cover both core and casing.

566,936 Automatic starter for electric motors; J. E. Putnam, Rochester, N. Y.—An electric motor, a variable resistance and contacts, springs on the levers for operating and contracting a latch and means for unlatching the contract-lever operated by the return movement of the lever.

566,939 Electric car brake; A. B. Roney, Chicago, Ill.—A motor, a screw-threaded shaft driven thereby, and a yielding connection between said shaft and the armature of the motor, a nut working on said shaft and held against rotation, and a brake rod connected with and actuated by said nut.

566,951 Signaling device; H. L. Webb, New York, N. Y.

566,984 Electric railway; R. M. Hunter, Philadelphia, Pa.

566,985 Telegraphy; J. M. Joy, New York, N. Y.—A rotatable commutator of a shaft, a metallic cylinder mounted on the shaft but insulated therefrom, a single pair of conducting segments in diametrically opposite sides of the cylinder and insulated from the latter, insulated rings on the ends of the commutator, and brushes making contact with the rings, cylinder and segments.

567,022 Electric light hanger; J. F. Diehl, Pittsburgh, Pa.—A mast having a laterally projecting arm, a trolley movable upon said arm, a cord arranged to draw the trolley along the arm, a stop upon the arm arranged to engage the trolley, and means operated by the cord for detaching the lamp from the trolley after the trolley is drawn against the stop.

567,044 567,045 Plate for secondary voltaic batteries; J. G. Rhodin, England—Comprises a perforated frame plate and plugs composed of a bundle of lead wires filling the perforations of said frame plate and producing permeable plugs to the interstices of which the electrolyte has access.

567,077 Telephone transmitter; N. L. Burchell, Washington, D. C.

567,112 Electrical communication; J. A. Sullivan, Cincinnati, Ohio—A permutation wheel having an armature mounted thereon and attached thereto, the wheel being in such relation to a magnet that the attraction of the magnet causes the rotation of the wheel, a magnet and a battery.

567,118 Trolley; F. W. Canales, Portland, Me.

567,119 Electric motor; R. Eickemeyer, Yonkers, N. Y.

Harry D. McDona has been appointed receiver for the Lynchburg, Va., Electric Company and the West Lynchburg Land Company at the instance of the People's Trust Company, of Brooklyn, N. Y.


**PATENTS.**

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REFERENCES: "Electrical Review," New York: Paul Cromlein, Teller Lincoln National Bank, Washington, D. C.; Judge Geo. D. Parker, Berkley, Va.; Second National Bank, Washington, D. C.; E. K. Leech, U. S. Mint, Philadelphia, Pa.; W. F. Newell, Manager and Secretary Water Works, Olympia, Oregon.

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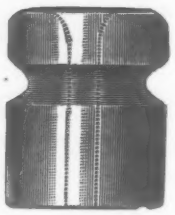

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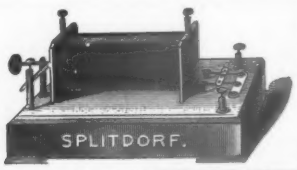


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